

**AUGUST • 1948**

**Vol. 5 • No. 8**



LONDON GUARANTEE BUILDING  
Michigan Avenue at Wacker Drive  
THE HOME OF

**finish**

MONTHLY TRADE PUBLICATION

*Published by*

DANA CHASE PUBLICATIONS  
360 North Michigan Avenue  
Chicago 1

Telephone Central 1229

The only independently published trade publication devoted exclusively to Porcelain Enameling and Ceramic Finishing on metal.

Free controlled circulation to management, purchasing and key plant personnel in companies intimately connected with the domestic ceramic finishing industry. To others, subscription price \$3.00 per year. Foreign subscription price (U. S. funds) \$5.00 per year.

Editor and publisher, DANA CHASE.  
Associate editors, PROF. A. I. ANDREWS  
and PROF. R. M. KING.

Acceptance under the act of June 5, 1934, at Aurora, Illinois, authorized January 7, 1948.

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	Page
FRIGIDAIRE'S CANADIAN ENAMELING PLANT.....By R. G. Drinnan	19
WATERLINING AS RELATED TO DRY BEADING.....By A. I. Andrews and W. D. Fitzpatrick	23
THE GROWING ACCEPTANCE OF ARCHITECTURAL PORCELAIN ENAMEL.....By M. J. Salton	29
HEATER SHIPPING WEIGHTS REDUCED FORTY POUNDS.....	33
VISUAL SYSTEM OF CONTROL.....By Jonas Howard	40
PRODUCTION OF COMMERCIAL AND REACHIN REFRIGERATORS — A Progress Report By M. E. McHardy	42

### *Features*

THE FINISH LINE — An Editorial .....	17
ENAMELED ART PRIZE WINNERS AT 30th ANNUAL CLEVELAND MAY SHOW	28
PLANT LAYOUT NO. 12 — A continuous furnace enameling plant for major appliances .....	36 & 37

### *Ceramic Finish News*

SUMMER HOMEFURNISHINGS MARKET .....	44
THE WASHINGTON ROUND-UP .....	46
INDUSTRY NEWS AND PERSONALS .....	49

### *Miscellaneous*

NEW SUPPLIES AND EQUIPMENT .....	59
NEW INDUSTRIAL LITERATURE .....	60
ADVERTISERS' INDEX .....	72
CLASSIFIED ADVERTISING .....	72

**CERAMIC FINISHES ON METAL**

Here's why it Pays to use *Century Frits* when

Porcelain Enameling

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PORCELAIN ENAMELERS of stove and range parts find that *Century time-proved* frits pay off in increased profits. These profits result from smoother plant operation, fewer rejects, faster production, and neater overall appearance.

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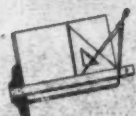


THE RIGHT COLOR IN CERAMICS IS A

## Team Operation



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Each Ferro color is a product of broad ceramic research—a joint operation of Laboratory Researchers, Color Chemists, Engineers, Production Technicians and others—“teamed” to give you the best product for each and every type of application.

Let us tell you more about these outstanding Ferro colors. Just drop us a line or get in touch with your Ferro Representative.

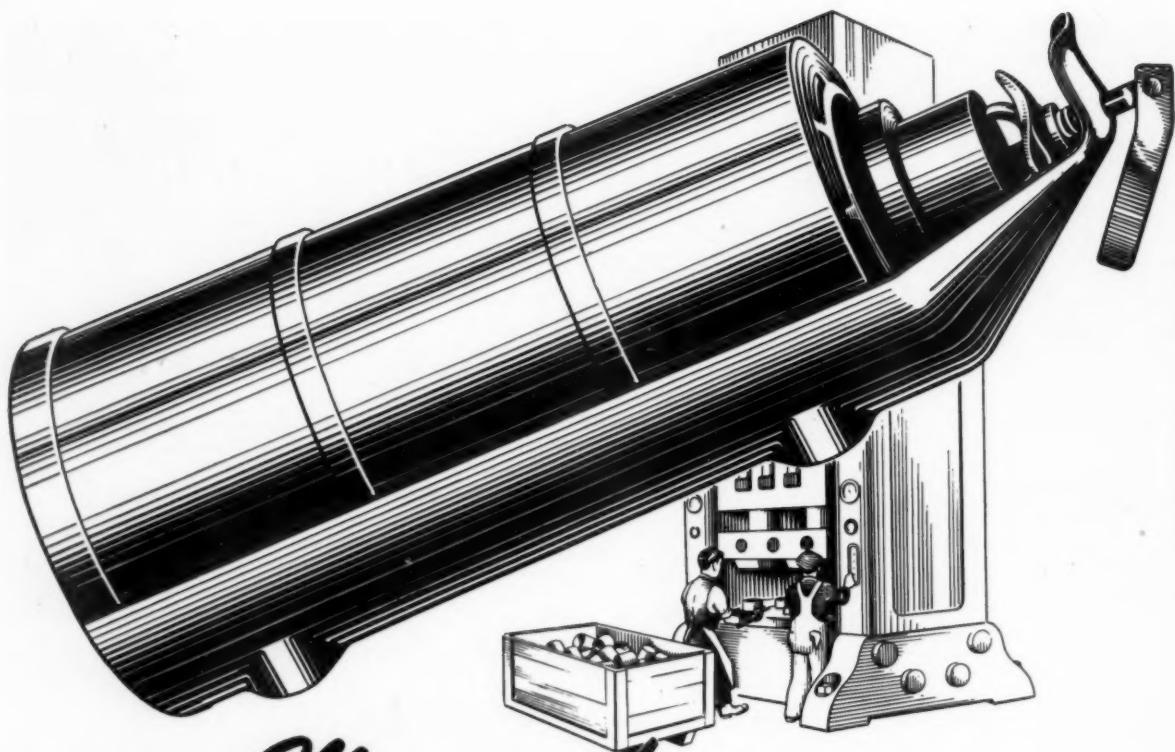
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*For further information on Monarch's Complete Service, write today.*



*When you think of Stampings, think of*

**NEW MONARCH MACHINE & STAMPING CO.**

406 S. W. NINTH STREET

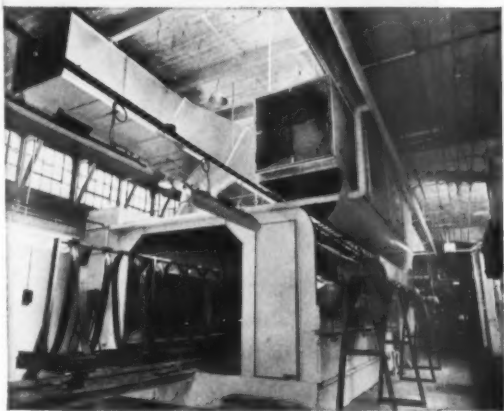
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# COMPLETE *Finishing* SYSTEMS

for ENAMEL • LACQUER • PAINT



Mahon Hydro-Filter Spray Booths, Drying Ovens and Filtered Air Supply Units—Part of a Complete Mahon Finishing System at Studebaker.



Another View of Mahon Hydro-Filter Spray Booths, at Studebaker, Showing Arrangement of Filtered Air Supply to Enclosed Spray Room. This Production Line Handles Bodies and Body Parts of the Studebaker Convertible.

## Planned and Engineered to Meet YOUR Specific Requirements!

Every Mahon Finishing System is planned and engineered to meet the individual production requirements of the manufacturer—right from the metal cleaning and rust proofing phase, through to final coat drying or baking. The reputation of Mahon planning engineers is unequalled in this highly specialized field. That is why so many manufacturers all over the world turn to Mahon for equipment to produce the finest finishes . . . they know that twenty-seven years of experience, together with constant research and pioneering development, have endowed Mahon engineers with a wealth of technical knowledge and practical know-how not available elsewhere. See Mahon Insert in Sweet's Mechanical Industries File for complete information, or, if you have finishing problems now, or contemplate new finishing equipment in the near future, arrange a consultation with Mahon engineers today.

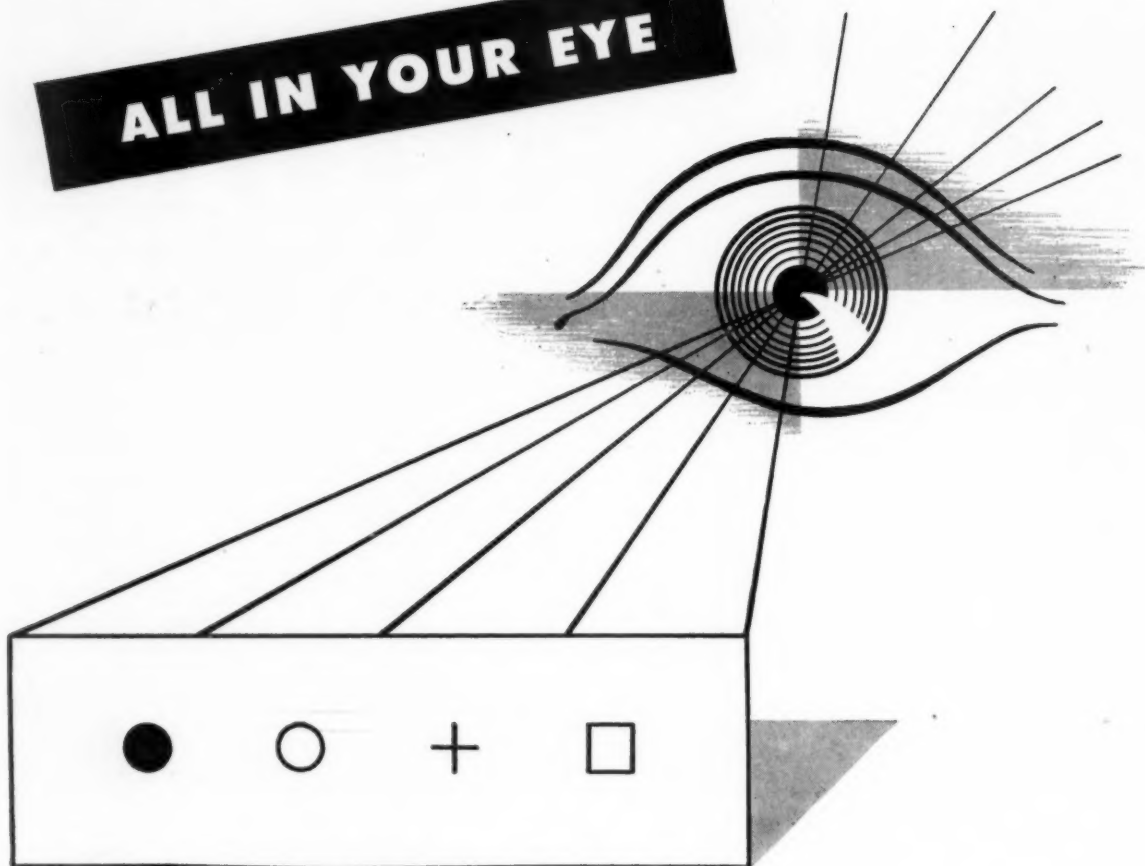
### THE R. C. MAHON COMPANY

HOME OFFICE and PLANT, Detroit 11, Michigan • WESTERN SALES DIVISION, Chicago 4, Illinois

Engineers and Manufacturers of Complete Finishing Systems including: Metal Cleaning Machines, Rust Proofing Machines, Dry-off Ovens, Hydro-Filter Spray Booths, Filtered Air Supply Units, and Drying and Baking Ovens. Also Paint Reclaiming Units, Hydro-Foam Dust Collectors, and many other Units of Special Production Equipment.

# MAHON

**ALL IN YOUR EYE**



CLOSE LEFT EYE AND HOLD PAGE AT ARM'S LENGTH. LOOK STEADILY WITH YOUR RIGHT EYE AT THE BLACK CIRCLE. MOVE PAGE SLOWLY TOWARD YOU, KEEPING RIGHT EYE STEADILY FIXED ON BLACK CIRCLE. THE OTHER FIGURES VANISH ONE BY ONE AS THE PAGE IS BROUGHT NEARER AND THEIR IMAGES HIT THE BLIND SPOT IN YOUR EYE.

You can't lose this optical blind spot; but mental blind spots can be eliminated.

Too few buyers are willing to admit that a part to be Porcelain Enameled should be designed especially for this life-time finish. Our engineers have 30 years of know-how. Use this knowledge to help your designers.

Some manufacturers think that porcelain enamel is an expensive finish.

It isn't. Let us quote on some of your parts, and you will see just how economically they can be made.

You have heard people say, "I can make something in my own shop for less money and do a better job than I can get on the outside." That is a blind spot.

For a clearer vision of porcelain enamel as applied to your business, it might be worth while to ask us a few questions.

**VITREOUS STEEL PRODUCTS CO.**

BOX 1791, CLEVELAND 5, OHIO (Factory at Nappanee, Ind.)



*Grind on Iron?  
Contaminate the Batch?*

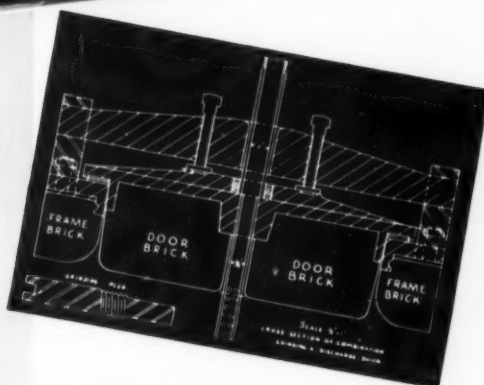


**Not a chance  
with  
MCDANEL  
MILLHEAD ASSEMBLIES**

The unique construction of McDanel Mill Head Assemblies may be seen in the diagrammatic sketch to the right. Notice how the specially shaped brick completely cover the door and frame castings. Photo A shows the mill ready to grind. Simply charge the mill, close the mill head and insert the grinding plug (Photo B). When grinding is completed, the mill door is *left in place*, which avoids dislodging partially ground material around the head. The perforated discharge plug (C) is inserted in place of the grinding plug and the mill is quickly and easily discharged.

Install McDanel Mill Head Assemblies throughout your mill room for greater uniformity and longer, more satisfactory service.

**MCDANEL**  
**REFRACTORY PORCELAIN COMPANY**  
BEAVER FALLS, PENNSYLVANIA



**\* HAND ROLLED GRINDING BALLS**

Made from specially developed vitreous porcelain body and hand rolled for faster, uniform grinding. Mill tested and individually inspected before shipment to you.

**\* MILL LINING BRICK**

Low in glass content, McDanel Mill Lining Brick gives maximum resistance to wear and long, satisfactory service. Complete size range to fit every size mill.

**\* MILL HEAD ASSEMBLIES**

Be sure to specify McDanel Mill Head Assemblies on your new mills. No metal can contaminate your mill charge with these patented covers. They are tops for uniformity of batch and long service.

**\* METAL COVERED GRINDING JARS AND MILLS**

Protected with heavy gage steel jacket McDanel Metal Covered Grinding Jars and Mills are easy to handle, easy to clean, discharge rapidly and stand up under long usage.

Specify McDanel Quality  
Porcelain Products when ordering  
**Chicago Vitreous Enamel Product Co.**  
CICERO 50, ILL.  
Exclusive representative of the Enameling Industry.



# These committees work for YOU

## when you belong to the P.E.I.

Seven important committees of the Porcelain Enamel Institute, comprising men who represent some of the industry's best brains and experience, are working for you constantly when you belong to this national association. If you are not now a member, you should consider the benefits of this work to your organization and to your Porcelain Enameled products.



This Emblem . . . . . designed by P.E.I. identifies products finished in genuine Porcelain Enamel. It sets these products apart as having the highest quality finish and guides the purchaser in making his selection. It is offered to manufacturers using genuine Porcelain Enamel as an important part of their product finish.

1. MARKET DEVELOPMENT COMMITTEE — provides the Institute, its sub-divisions and individual members, counsel, guidance and assistance in connection with the successful marketing of Porcelain Enameled Products and supervises advertising and publicity activity.

2. COMMERCIAL RESEARCH COMMITTEE — locates, investigates, studies and reports on both existing and potential markets, advising the membership on market trends and opportunities.

3. PRODUCT STANDARDIZATION COMMITTEE — develops methods of testing and evaluating properties of Porcelain Enamel and develops practical apparatus for test work. (*A research fellowship at the National Bureau of Standards effectively backs the work of this committee on testing and evaluation methods.*) Performance specifications are also a part of this committee's activity.

4. PROCESS DEVELOPMENT COMMITTEE — does research and reports on the practicability of new technical developments, and new equipment and processes for improved efficiency in enamel plant operation.

5. FORUM COMMITTEE — evaluates technical progress in Porcelain Enameling and develops programs for the annual PEI Forum for plant men — a most valuable industry asset.

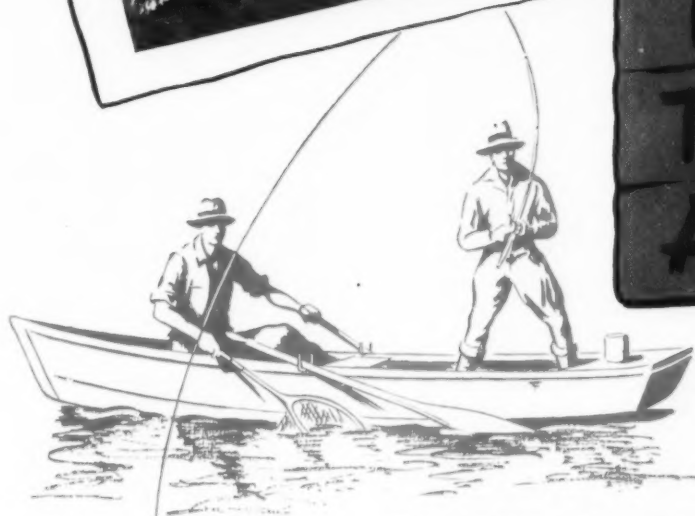
6. THE INSTITUTE DEVELOPMENT COMMITTEE — works to broaden the base of Institute activity, to strengthen its structure and to expand its opportunities for rendering greater service to the membership.

7. SALES AND MANAGEMENT CONFERENCE COMMITTEE — has the responsibility of developing a program for an annual conference to present selling methods and demonstration techniques to assist management and sales management in the promotion and sale of porcelain enameled products.

If you operate a Porcelain Enameling plant, P.E.I. membership will pay rich dividends to both your operating and sales departments. Write for membership information to —

**PORCELAIN ENAMEL INSTITUTE, INC.**

1010 VERMONT AVE. N. W., WASHINGTON 5, D. C.



He earns his pay because he knows where the fish are, what they're hitting, what tackle to use. And he takes you there so you can catch them.

He's no brighter than you, but he's got *experience*. Everything he advises you to do he has tried out for himself . . . that's how he knows it'll work. And it's the same with Ing-Rich PORCELFRIT. Because we use it constantly in our own job enameling plant, we keep improving it to meet actual conditions. Then, just to be sure, we send our own trained ceramic engineers, with no obligation on your part, to make sure plant-tested PORCELFRIT will work on *your* product. Let your Ing-Rich "guide" put his experience to work for you!



INGRAM-RICHARDSON MFG. CO. OF INDIANA, INC.

OFFICES, LABORATORY AND  
PLANT, FRANKFORT, INDIANA

**Many  
Porcelain  
Enamellers  
Prefer**

**TREOPAX Z  
TREOPAX S  
TREOPAX  
for**

**Color Stability  
Scratch Resistance  
Opacity  
Enamel Working  
Properties**

The experience of users is a good yardstick for determining the worth of a product. Our Field Engineers report the following summarized statements from Superintendents in the Porcelain Enamel Industry:

**TREOPAX Z** "Very pleased with results...standardizing 100% on Z."

**TREOPAX S** "Doing a beautiful job on table tops and sinks."

**TREOPAX Z** "All white now being opacified with Z."

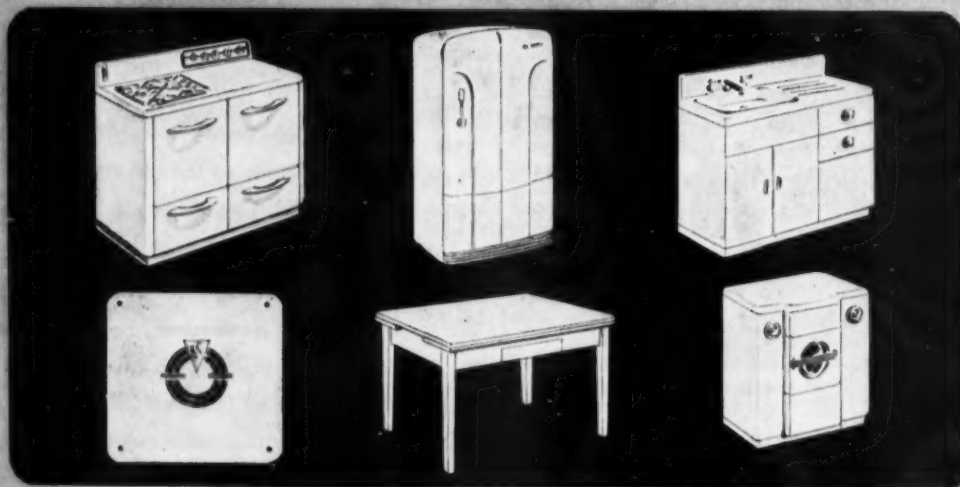
**TREOPAX** "Rates as the best opacifier made."

**TREOPAX Z** "Our standard opacifier in steel enamel."

**TREOPAX Z** "Giving excellent results in zircon enamel."

**TREOPAX** "Use being continued in cast iron and antimony AR."

Our field engineers are well equipped to discuss your problems. They can support their recommendations by laboratory data and by practical experience with shop conditions.



**TAM**

**TITANIUM ALLOY MANUFACTURING COMPANY**

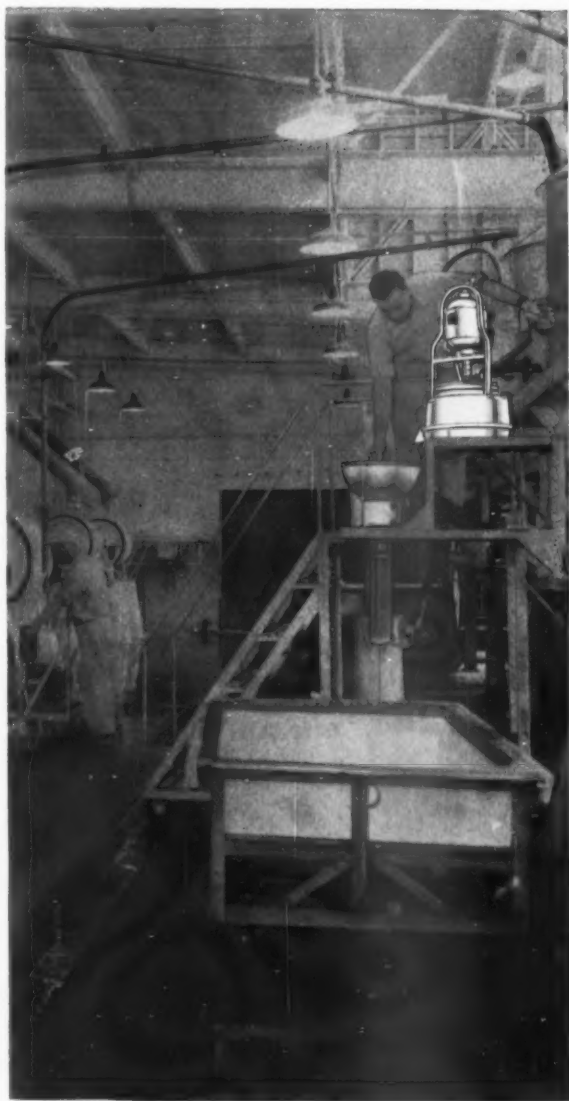
EXECUTIVE AND SALES OFFICES  
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111 BROADWAY, NEW YORK CITY  
NIAGARA FALLS, NEW YORK

IN CANADA and AROUND THE WORLD

*Rotospraying...* is the

## ACCEPTED WAY of SIEVING



Rotospray is the equipment used in the mill room of Frigidaire Products of Canada Limited, Leaside, Ontario, Canada.

Yes . . . Rotospraying, the modern method of sieving enamel slip, is being used in porcelain enameling plants around the world.

In the United States, the Rotospray has long since become the standard equipment for the efficient and economical sieving of porcelain enamel slip.

In Canada and countries the world around, Rotosprays now give the same dependable service day in and day out.

To be sure you get the right Rotospray for your job, contact Rotospray direct . . . or one of our sales representatives.

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(Reg. U. S. Pat. Off.)

*"Worth waiting for"*

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FERRO ENAMEL CORP., Cleveland, Ohio and foreign offices  
CHICAGO VITREOUS ENAMEL PRODUCT CO., Cicero, Ill.  
BRAUN CORPORATION, Los Angeles, Cal.  
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Foreign representatives —

WATFORD ENGINEERING WORKS, Watford, England  
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ROTOSPRAYS ARE ALSO USED EFFECTIVELY IN CHEMICAL PLANTS, PAPER MILLS, AND POTTERIES

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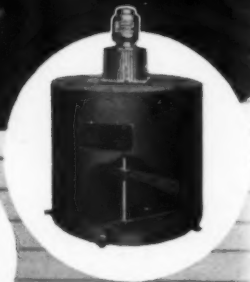
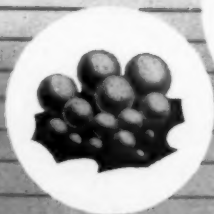
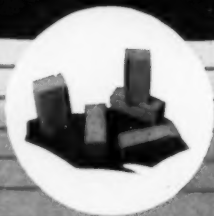
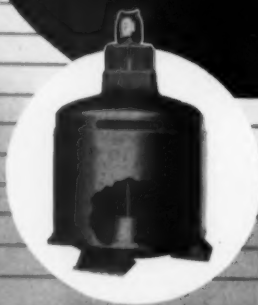
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CARRYING  
YOUR  
PORCELAIN  
ENAMELS  
THROUGH  
TO A  
**PERFECT**  
**FINISH**

*Patterson*

SATISFACTORY  
MACHINERY



**THE PATTERSON FOUNDRY & MACHINE CO.**

EAST LIVERPOOL, OHIO, U. S. A.

IN CANADA

THE PATTERSON FOUNDRY & MACHINE CO. (CANADA) Ltd., Toronto, Canada



# THE Finish Line



**THE STRAITS OF MACKINAC** — and the environment of the Grand Hotel on beautiful Mackinac Island are not conducive to taking time out to jot down a few lines for the Finish Line, but there is one subject that deserves added attention regardless of the atmosphere or the place—that is the subject of porcelain enameled refrigerator exteriors. We have had more favorable comment from readers on our treatment of this “pet peeve” than on any other of the subjects covered on this page.

## The public wants them

If you will check, you will find that some of your immediate neighbors are in the market for new refrigerators, and that they are trying to find (fruitlessly, of course,) refrigerators with porcelain enameled exteriors.

Just before leaving home for the AWIMA convention at Mackinac, a neighbor told us that a new refrigerator was being moved in. This neighbor has owned a porcelain enameled unit and has consistently refused (for six months) to buy a new one until a porcelain enameled exterior could be found. Finally the search was given up and a new unit, sans porcelain enamel, was purchased. It is interesting to note that the new one is *not* the same make, and the customer is *not* satisfied and *won't* be satisfied until a porcelain enameled unit can be obtained.

This is only one of many, many cases where good friends of porcelain enamel—friends resulting from long-time satisfaction with older appliances—are required to buy something they don't want because at present no manufacturer is offering the new models with the *only* lifetime finish on refrigerator exteriors.

## The dealer wants them

Yesterday we stopped in a modern appliance store, Grand Haven Maytag Co., Grand Haven, Michigan. After making a purchase, we took a good look at the latest model of one of the leading electric refrigerators on display in the window.

finish AUGUST • 1948

We asked a casual question, “Is it porcelain enamel?” From Mr. J. Wierenga came this answer: “No, and we can't get them any more. When they were available we sold porcelain enameled refrigerators two to one over the other finishes. The manufacturer tells us that as soon as the proper steel is available, porcelain models will again be in the line. We wish we had them now.”

## It's a sad situation

If the cases referred to were isolated ones, there would be little reason to comment. They are *not* isolated cases, and any manufacturer can determine this for himself by having an impartial research conducted among both dealers and consumers.

There is a growing appreciation for the permanence that *only* porcelain enamel can give to the beauty of the new refrigerator cabinets.

The manufacturer who first takes advantage of this existing market will be buying a life insurance policy—a policy insuring repeat business from satisfied customers for many years to come. It is readily admitted that the day of selling a product irrespective of lasting qualities—permanence—are just about over. Now is the time to prepare for that change of pace.

Not all of the responsibility rests with the refrigerator manufacturer. The producers of the materials which go into these more permanent cabinets have done much in recent years to make a fine finish even finer, to make it easier and more economical to apply.

There is a further responsibility—that of continuing to educate those dealers, salesmen and consumers who do not know the vast differences between refrigerator cabinet finishes, so that they will be as discerning as those who do know and *want* to buy the best.

*Dana Chase*  
EDITOR AND PUBLISHER



## Sheets That DRAW DEEP ... with Minimum Breakage

There is an important reason why Inland Enameling Iron Sheets provide real deep-drawing performance—no matter how difficult the application may be. *They're tailor-made.* Inland metallurgists investigate thoroughly the fabricating problems involved—then process a sheet designed to the specific application and operation. Because of this procedure Inland sheets may be efficiently and economically fitted to the equipment in your plant and to existing methods of fabrication.

In addition, the use of Inland Enameling Iron Sheets produces better enameling results because of "double-tight" adherence, sag resistance, and correct chemical composition. We are striving to increase our production of these quality sheets in order to meet the unusual demand for them. INLAND STEEL CO., 38 S. Dearborn St., Chicago, Ill. Sales Offices: Chicago, Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul.



# INLAND *Enameling Iron Sheets*

OTHER PRODUCTS: BARS • STRUCTURALS • PLATES • SHEETS • STRIP • TIN PLATE • PILING • FLOOR PLATE • RAILS • TRACK ACCESSORIES

# Frigidaire's Canadian enameling plant

**description of latest equipment and methods employed in the production of refrigerators, ranges and other major appliances**

*By R. G. Drinnan*

SC. D., SUPERVISOR OF ENAMELING OPERATIONS, FRIGIDAIRE PRODUCTS OF CANADA LIMITED, LEASIDE, ONTARIO, CANADA



Toronto, Canada's second largest city, is the home of Frigidaire Products of Canada Limited. In a modern factory the Canadian Company, whose management is

100 percent Canadian, manufactures many of the products of Frigidaire. Each refrigerator, electric range, ice-cream cabinet, beverage cooler, or commercial unit is produced in Canada according to specifications approved by the parent company, Frigidaire Division, General Motors Corporation, Dayton, Ohio, except for certain minor differences demanded by the Canadian Standards Association. The Canadian products, therefore, look and are the same as those being produced in the United States.

A large postwar reconversion and development program to make the Canadian plant as independent as possible of American imports is now almost completed. Part of this program was the erection of a new building and the installation of modern equipment for porcelain enameling. Prior to March, 1947, when the new porcelain plant went into production, all porcelain parts were shipped into Canada from the Frigidaire plant at Dayton. Now when it is necessary to Canada's economy to save American dollars for very essential purchases in the United States, this new Frigidaire porcelain plant is contributing its full share toward this objective along with other Canadian industries. Frits and many other raw materials used in porcelain operations at the new plant are manufactured and purchased in Canada.

The entire layout and choice of equipment were made upon the recommendations of Dayton engineers who have a wealth of porcelain experience, and the company spared no expense in obtaining equipment considered essential to the manufacture of good quality porcelain.

In a climate where the temperature at times goes down to twenty or thirty degrees below zero, enclosed type spray booths are desirable, and particularly so when the factory laws of the Province prohibit the recirculation of any exhausted air from a spray booth, regardless of how well it has been cleaned and filtered.

Hydro power, after certain demand loads, can be purchased in the Toronto area at low rates and this factor influenced the installation of an electric continuous U type firing furnace and electrically heated tunnel drying ovens.

The continuous automatic pickling machine is, as far as we know, the only completely automatic pickling machine in a porcelain plant in Canada.

Cable conveyors used on ground and cover coat lines were constructed entirely in our own machine shop, and, wherever possible, Canadian made equipment was used throughout the entire plant.

## Material storage and mill room

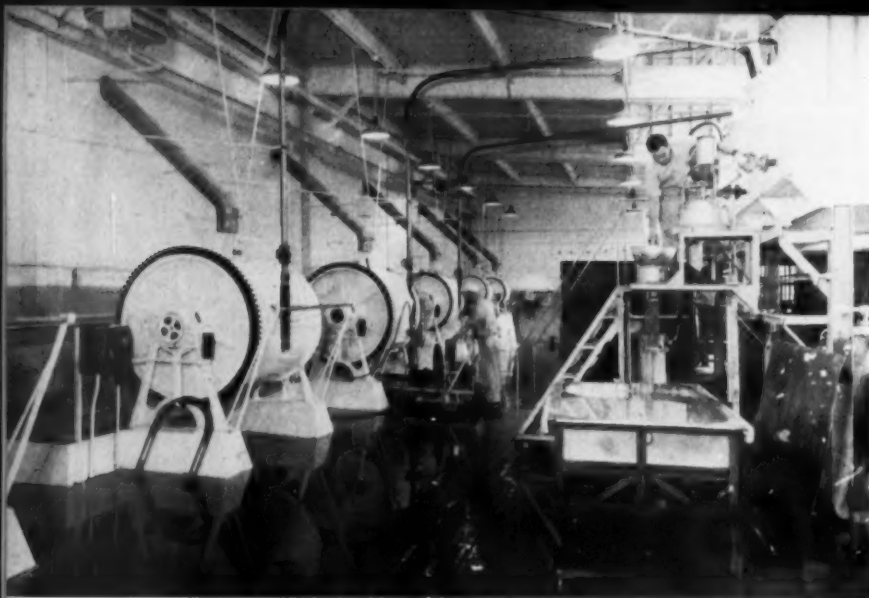
All raw materials used in the mill room are stored in the mill storage room on the second floor of Building Three adjacent to the mill room. Weighed mill charges are fed by gravity from monel metal hoppers through 10" monel pipes directly into the ball mills below in the mill room. This arrangement works sat-

isfactorily without the need of vibrators on the chutes or blowing out with air to empty the chutes. A readily detachable coupling clamps on to the end of the chute and fits snugly into the ball mill door opening during charging. City water, without any softening or purification, is delivered to the mills through a system of piping from a recording and automatic shut-off water meter. Each mill is equipped with a water spray for cooling the outer surface during milling, and high and low pressure air is at hand beside each mill.

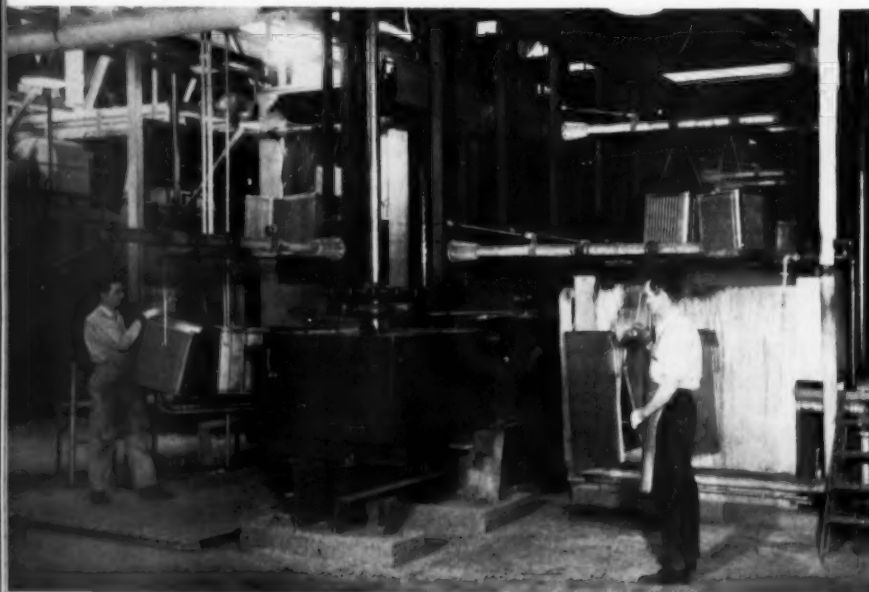
There are three 4' x 5'—1000 pound mills; one 3' x 4'—500 pound mill; and two 2' x 3'—120 pound mills. All mills have motor and helical gear reducer direct connected, electric brakes, and across-the-line starters with three station push button controls easily accessible from the front of each mill. Five mill frit storage tanks, porcelain lined, equipped with monel metal covers are mounted on an elevated platform on the opposite side of the mill room. Each vat is equipped with stirrers and vertical unipower drive from 1½ H.P. motors.

The transfer of the milled enamel slip from ball mill to storage vat is done through 2" diameter monel pipes. Each mill is mounted on concrete pedestals at a height which permits discharge into a monel hopper that can be pushed underneath on a moveable carriage. Mounted on the carriage is a rotary-screw-type pump with electric motor, magnetic starter and push button station, and a suction pipe into the hopper. The discharge side of the pump is readily attached by flange



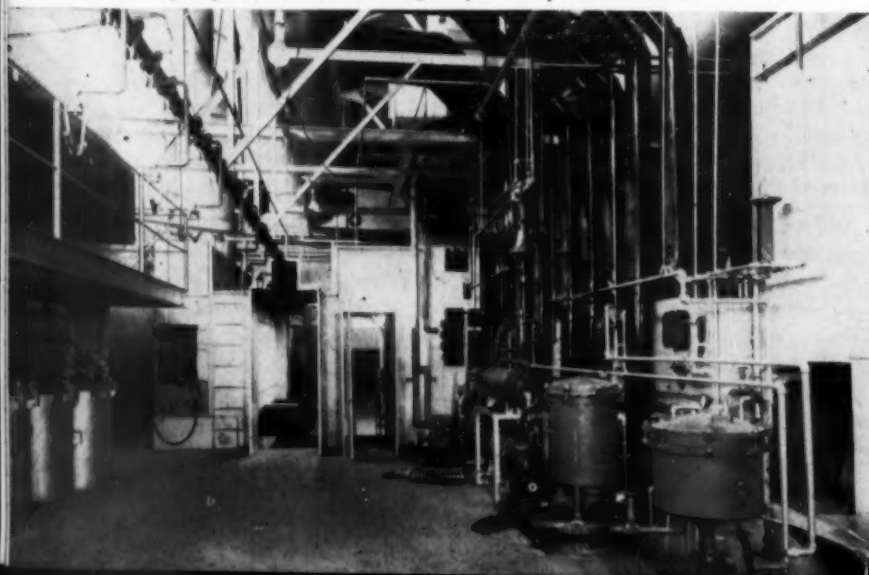


*General view of the mill room in the plant of Frigidaire Products of Canada.*



*Loading and unloading stations of the continuous automatic pickling machine.*

*Left, ground coat spray booth and ground coat dipping area; right, filters, pumps, and heat exchangers for the pickle machine.*



and quick-acting cam type screw to the 2" diameter pipe leading from the mill to the storage vats. High pressure air (125 pounds) is connected by snap-on hose connection to a nipple welded into the outlet pipe near the pump. When the mill has been emptied and the enamel pumped over to the storage vat, the air valve is opened and the remaining enamel in the 2" pipe is blown into the vat. This simple device works very satisfactorily. Separate units are used for pumping ground coat and white enamels.

Two Rotospray and magnetic separator units are mounted, one above the other, on carriages which can be easily moved by hand along a track attached to the platform holding the storage vats. With this arrangement pressure feed tanks and dip tanks can be moved under any storage vat and the enamel fed directly through the sieve and separator into the container below. Final setting up of enamels is done after they have been drawn out of storage vats, before being taken to the dipping floor or spray booths.

The mill room concrete floor is sloped from both sides to a centre drain, with a settling sump, before discharge to the main drain. Monel metal valves are used throughout on all pipe handling enamels. Dip tanks are constructed for water cooling; pressure feed tanks used are standard 30 and 60 gallon capacity with air motors. The entire arrangement is such that it is very easy to keep the mill room clean. Communication with the control laboratory and mill storage room is accomplished by telephone.

#### **Washing machine used prior to continuous automatic pickling**

All parts to be porcelainized, with the exception of food compartment liners for refrigerators, are put through a washing machine prior to going through the metal finishing department. This primary cleaning has been found to be helpful in obtaining a thorough metal finishing job; it permits much closer inspection of all parts before they are delivered to the pickling machine, and

it facilitates removal of the drawing compounds on the ware in the pickling operation.

The continuous automatic pickling machine is of the carrier arm type. The machine has 46 carrier arms, overall length of 80 feet 8 inches, and overall height of 11 feet 2½ inches. The height of lift is 56 inches and transfer time is 45 seconds. Tanks and machine were specifically designed to give a definite pickling cycle developed from operating experience at Dayton on their very large automatic pickling machines. The machine is completely automatic and the pickling cycle can be varied within certain limits merely by changing the setting of a vernier dial on the control panel.

The pickling sequence used is as follows:

1. Boiling alkali cleaner
2. Cold water rinse
3. Boiling alkali cleaner
4. Hot water rinse
5. Second hot water rinse
6. Sulphuric acid pickle at 140°F.
7. Cold acid rinse
8. Nickel dip at 140°F. and pH — 3.0
9. Cyanide neutralization at 140°F.
10. Second neutralization at 140°F.
11. Hot air blast drying

The concentrations of all solutions in the pickling tanks are in line with generally accepted practice, and careful chemical control is maintained by routine daily testing.

#### Automatic indicating

##### temperature controls used

The sulphuric acid tank is lined with chemical lead sheet and heated by low pressure steam in lead coils suspended on either side of the tank. The nickel tank is lined with vulcanized rubber. A duriron pump continually circulates the nickel solution through two steam heated duriron heat exchangers, connected in parallel, outside the tank. Cleaner, neutralizer, and hot water rinse tanks are heated by steam coils suspended on two sides of the tanks. All tanks except cleaner and rinse tanks are equipped with automatic indicating temperature controls. Fumes and steam are drawn off from

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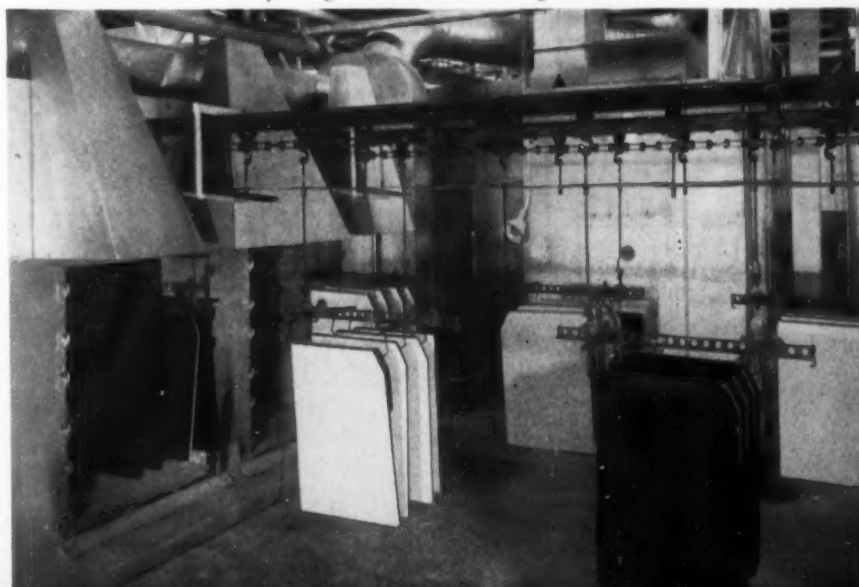


*Enamel is piped into cover coat spray booth from pressure feed tanks on outside.*

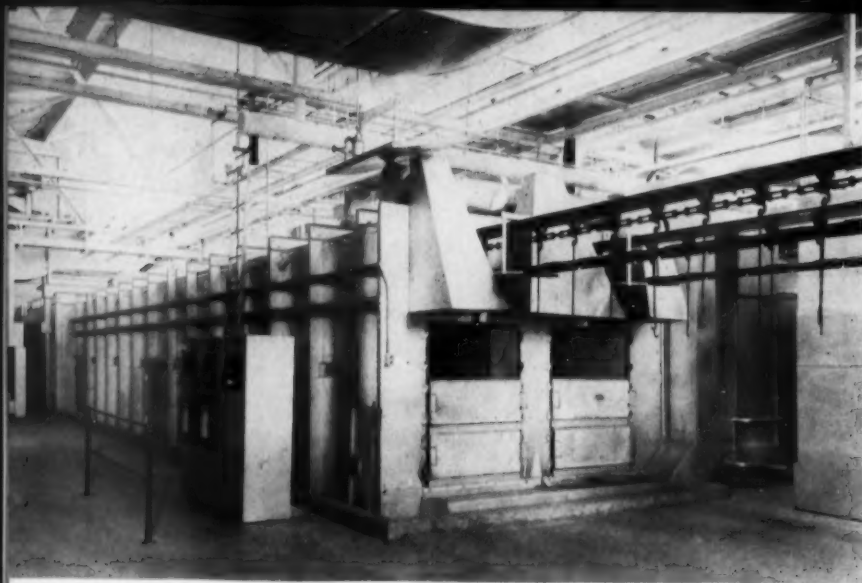


*View showing the arrangement of motorized brushing tools in the brushing booth.*

*Firing both cover coat and ground coat on same furnace chain. Enclosed reinforcing booths are in background.*







*View of continuous U-type electric firing furnace showing control equipment.*



*Dan Cherry (Dayton); Bob Drinnan and Carl Cannon, pres. and gen. mgr. of Frigidaire Products of Canada; W. H. Pfeiffer and Harley Stratton (Dayton).*

*Section of enamel control laboratory showing spraying and firing of test panels.*



the top of the tanks through exhaust casings, and on the opposite side all tanks except the sulphuric acid and nickle dip are equipped with dam type overflows. Each tank is equipped with bottom side drains and outlets into acid-proof concrete drain trenches which lead to a large sump. The nickel solution and the alkali-cyanide neutralizer solution are continually circulated through separate filters.

The drying oven is constructed so that the bottom of the oven is at the same height as the top of the pickle tanks. The carrier arms, with ware attached, rise out of the last neutralizer tank and move horizontally through the drying oven and are then lowered to proper level for unloading. Hot air, heated by steam coils, is forced by two large fans through nozzle type openings on the sidewalls and bottom of the drying oven. The oven is equipped with automatic temperature controls and has an insulated housing. Very effective drying is obtained in a relatively short travel space.

All monel metal tooling has been designed to give proper drainage of ware when the carrier arms lift it out of the pickle solutions, and there is very little carryover from one tank to the next tank. To conserve space, all bulky tooling, when not in use, is stored by hanging it from the roof trusses on hooks attached to a monorail track. A small electric hoist is used to lift the heavier tooling. Two large food compartment liners, or as many as five range panels, are hung on one carrier arm.

All electrical controls for motors on fans, pumps, and drives are mounted together on a panel adjacent to the unloading station. Automatic safety control devices have been installed on all vital operating parts, and catwalks and platforms have been erected to facilitate routine inspection and maintenance. Chemical additions to the tanks are accomplished during operation by the use of special baskets suspended from the side of the tanks, or by

to Page 63 →

**See plant layout . . . Pages 36 & 37**

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# Waterlining as related to dry beading

By *A. J. Andrews* • ASSOCIATE EDITOR, HEAD OF DEPARTMENT OF CERAMIC ENGINEERING, UNIVERSITY OF ILLINOIS, AND

*W. D. Fitzpatrick* • DEPARTMENT OF CERAMIC ENGINEERING, UNIVERSITY OF ILLINOIS



With the introduction of titanium opacified cover enamels, the problem of waterlining has taken on increased significance as these enamels are especially subject to this defect when they are dry beaded. Dry beading is the process of applying wet beading enamel along the wiped edge of previously dried cover enamel. This results in some of the water from the beading enamel soaking into the dry cover coat bisque, discoloring it and sometimes causing tearing. Since many enameling operations are set up for dry beading, an investigation of this problem was undertaken.

The enamel literature gives only brief reference to waterlining except for one paper by Whitesell<sup>1</sup> and a discussion of it by Hansen<sup>2</sup>. The cause of water lining was described as due to the soluble salts concentrated by the water of the beading enamel in the cover coat bisque. This concentration is most pronounced at the line of greatest penetration of the water causing a line of discoloration. These salts, according to the authors mentioned, result in a fluxing of the cover enamel. Whitesell found that potassium carbonate in the water lined area caused blisters. Sodium thiosulphate and also sodium nitrate were found to eliminate the line of discoloration. Both authors reported that organic vehicles

such as alcohol for the beading enamel would completely eliminate waterlining but that they were unsatisfactory as a vehicle.

### Preliminary study

The seven different types of enamel shown in Table 1 and the beading enamels in Table 2 were used throughout the investigation. Four by four inch sample plates were either sprayed or dipped and the cover enamel was wiped through the center as shown in Figure 1. The beading enamels or liquids were applied at the four points indicated.

The effect of the rate of drying was investigated first, using all seven enamels and different rates for drying the beading enamel. It was con-

Table 1.  
Composition of Cover Coat Enamel Frits

	Titanium Enamels		Fluoride Enamels		Antimony Enamels		Zircon Enamels
	A.R.	Non A.R.	A.R.	Non A.R.	A.R.	Non A.R.	
Feldspar (Keystone) .....	4.2	5.0	19.5	31.9	17.6	9.5	—
Borax .....	29.3	—	17.9	22.3	22.88	18.0	—
Borax (Dehy.) .....	—	—	—	—	—	—	20.6
Flint .....	42.3	28.6	28.4	19.8	23.47	39.0	—
Soda Ash .....	—	27.0	13.1	5.8	6.7	10.0	—
Soda Nitre .....	3.0	2.7	4.9	3.0	2.93	3.0	2.91
Fluorspar .....	—	—	2.9	3.9	2.51	1.5	4.21
Crvolite .....	6.6	2.9	—	10.6	8.38	—	11.80
Whiting .....	.6	—	—	—	—	—	7.46
Sodium Silico Fluoride .....	—	—	6.5	2.9	—	5.0	4.21
Zinc Oxide .....	2.9	24.8	—	—	2.93	—	4.21
Sodium Antimonate .....	.2	.9	—	—	12.58	9.5	—
Titanium Dioxide .....	9.8	19.3	6.7	—	3.0	3.0	—
Aluminum Hydrate .....	1.1	—	—	—	—	—	3.83
Pyrophyllite .....	—	—	—	—	—	—	30.30
Milled Zircon .....	—	—	—	—	—	—	10.34
Magnesium Carbonate .....	—	3.8	—	—	—	—	—
Bone Ash .....	—	—	—	—	—	1.5	—
	100.0	100.0	99.19	102.2	100.0	99.98	99.87

Mill Batch (except where otherwise specified)

Frit  
Clay  
Potassium Carbonate  
Sodium Nitrate  
Water (distilled)

100.  
6.  
0.25  
0.125  
40.

Fineness 4 to 6 % (P.E.I. Test)

**Table 2.**  
**Composition of Beading Enamel Frits**

	Blue	Blue-Black	Black
Feldspar (Keystone) .....	35.1	9.02	29.2
Borax .....	—	18.7	29.8
Borax (Dehy.) .....	15.1	—	—
Flint .....	20.7	36.80	15.0
Soda Ash .....	3.1	3.20	4.6
Soda Nitre .....	.8	5.30	6.0
Fluorspar .....	5.4	7.20	2.8
Cryolite .....	14.4	—	2.8
Sodium Silico Fluoride .....	—	6.60	—
Zinc Oxide .....	2.2	—	—
Titanium Dioxide .....	—	5.07	—
Co <sub>2</sub> O <sub>4</sub> .....	3.2	.72	1.6
MnO <sub>2</sub> .....	—	3.63	5.5
NiO <sub>2</sub> .....	—	2.70	—
Cr <sub>2</sub> O <sub>3</sub> .....	—	—	1.1
CuO <sub>2</sub> .....	—	—	1.6
	100.0	100.0	100.0

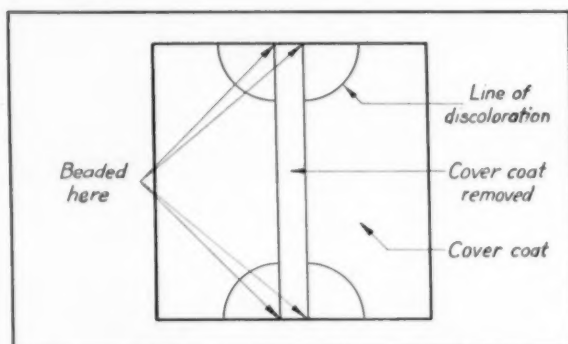
cluded that drying was of minor if of any practical importance. All samples showed a line of discoloration at the region of farthest penetration.

To determine the part played by the beading enamel frit, the complete series of cover enamels was beaded with potters flint in distilled water and with distilled water alone. This proved that the beading enamel was not the only factor, as a line of discoloration was obtained in all cases. It was probable, therefore, that the

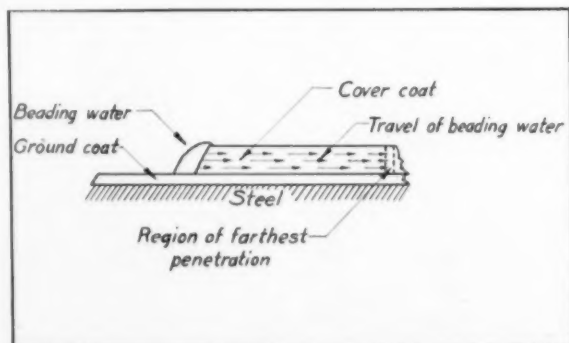
beading water concentrated the solubles available in the cover enamel.

Potters flint could not be applied as an enamel with only water present, so it was milled with the standard cover enamel mill addition. On beading with distilled water it showed a faint line of discoloration, but the concentration of these salts at this line were further evidenced by the slightly greater fused condition of the coating at this region after firing.

Coarse and fine milling of zircon



**FIGURE 1**—Diagram of test piece on which beading enamels or liquids were applied at four points.



**FIGURE 2**—Sketch illustrating the penetration of the beading water into the bisque cover coat.

enamels showed greater waterlining tendency with the finely ground enamel. A difference of specific gravity 1.64 and 1.84 did not indicate any difference in waterlining tendency.

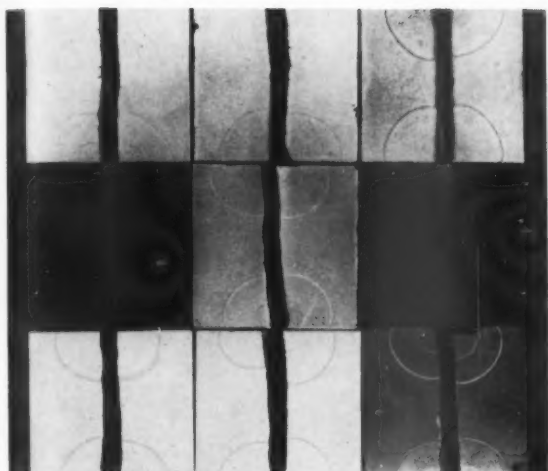
Organic liquids such as benzene, ethyl alcohol, amyl acetate, diet glycol, methyl alcohol, glycerine, cello-solve, denatured alcohol and xylene used as beading vehicles showed no water lining tendencies. This was assumed to be because of the insolubility of the salts in these liquids.

On using the mill additions recommended in the literature which included sodium thiosulphate and sodium nitrite, no elimination or great improvement was noted in the waterlining tendency of any of the enamels selected for this investigation.

The beading water wets the bisque cover coat and is drawn through the cover coat by capillary action. The distance to which the beading water penetrates the cover coat is governed by: (1) the capillary structure of the cover coat, (2) the amount of beading water, and (3) the rate of drying of the beading. As the beading water travels through the cover coat, it dissolves some of the soluble salts. The area wetted by the beading water remains moist for several seconds, even after the liquid film of the beading water has disappeared. As long as this area of the cover coat appears moist, the water being evaporated is replenished, and the travel of the water is from the beading to the line of farthest penetration. This travel of water causes the supersaturation of the beading water in the region of farthest penetration. As the water becomes supersaturated with the soluble salts, the soluble salts are precipitated. Thus the drying of the beading water builds up a concentration of the soluble salts in the region of the farthest penetration of the beading water. This is illustrated in Figure 2.

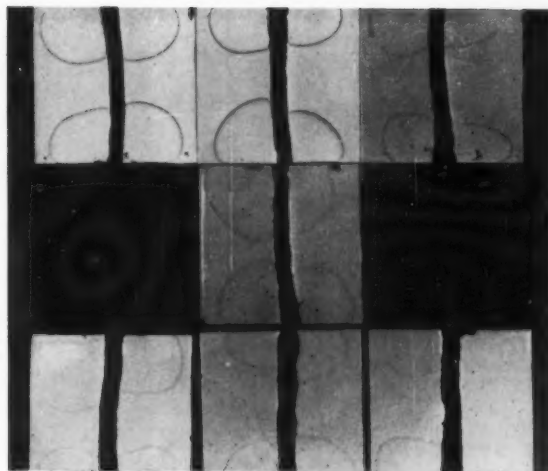
#### Thermal studies

In the preliminary work, it was noted that the test pieces fired for different times indicated that the firing behavior in the region of discoloration was considerably different than the firing behavior of the



1400° F.      1450° F.      1500° F.  
1000° F.      1300° F.      1200° F.  
1100° F.

FIGURE 3—Each of the test pieces used in the thermal study of zircon enamels were heated at specified temperature for one hour.



1000° F.      1100° F.      1200° F.  
1400° F.      1300° F.      1500° F.  
1450° F.

FIGURE 4—Test pieces used in the thermal study of titanium enamels were also heated at specified temperature for one hour.

rest of the cover coat, therefore a thermal study was undertaken. In order to eliminate the effect of electrolytes, the enamels used in this study were milled with only clay and water so that the resulting line of discoloration could be due only to soluble salts leached from the frit.

Zircon and acid-resisting titanium enamels were milled with the following mill additions:

Frit .....	100%
Clay .....	6%
Distilled Water .....	40%
Fineness .....	4 to 6% <sup>(2)</sup>
(P.E.I. Test)	

The enamels were each applied to seven test pieces by spraying. The weight of application was forty grams per square foot. The test pieces were dried slowly and beaded

with distilled water, and the beading dried slowly.

The test pieces were fired at a specific temperature for one hour. The temperatures used were: 1000° F., 1100° F., 1200° F., 1300° F., 1400° F., 1450° F., and 1500° F.

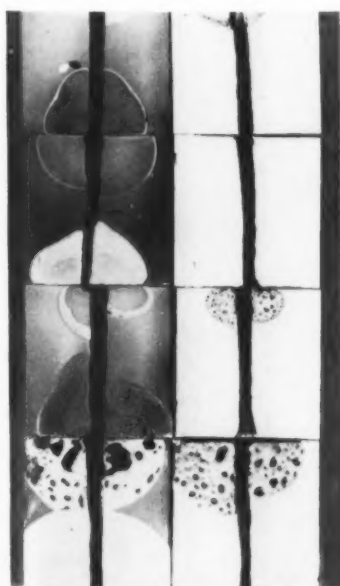
The same procedure was applied to enamels in the aging study, except that they were applied after three conditions of aging, namely: (1)

The three figures below show test pieces beaded with saturated solutions. In each figure the pieces on the left were fired for 1 minute, the ones on the right for 3 minutes. The key to the numbers on the sides can be found in Table 3.

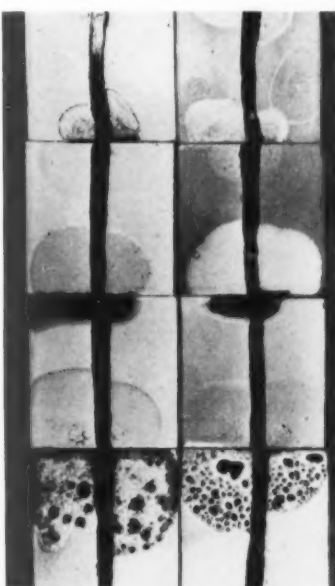
FIGURE 5—Zircon enamel.

FIGURE 6—Titanium enamel.

FIGURE 7—Antimony enamel.



1  
2  
3  
4  
5  
6  
7  
8



1  
2  
3  
4  
5  
6  
7  
8





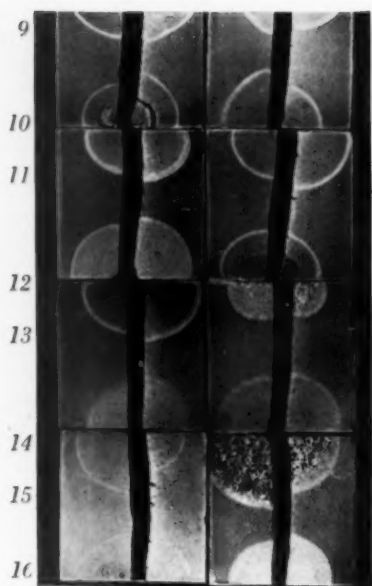


FIGURE 9—Titanium enamel.

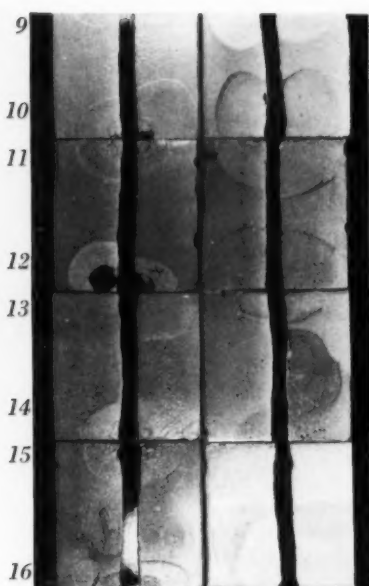


FIGURE 8—Zircon enamel.

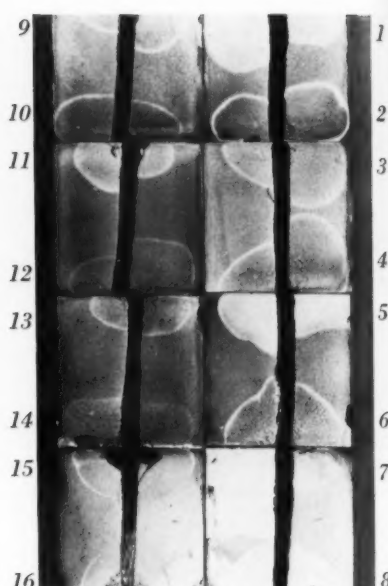


FIGURE 10—Antimony enamel.

The three figures above show test pieces beaded with 50% saturated solutions and fired for one minute. The key to the numbers on the sides can be found in Table 4.

directly from the ball mill, (2) after two days aging at room temperature, and (3) after one week aging.

In the series of zircon enameled test pieces heated at a specific temperature for one hour (Figure 3), the results were as follows:

Dried—The line of farthest penetration of

the beading water displayed a slight discoloration (light brown).

1000° F. — The line of discoloration changed in color to a light grey and displayed a slight amount of fusion.

1100° F.—Very similar to the test piece fired at 1000° F., except that tearing between the line of discoloration and the cover coat was evident.

1200° F.—The cover coat fused sufficiently to lose its opacity and the line of discoloration displayed nearly complete fusion and became nearly opaque. Tearing between the cover coat and the line of discoloration became more pronounced.

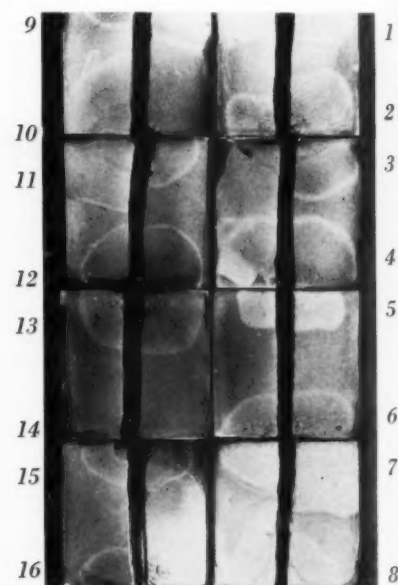
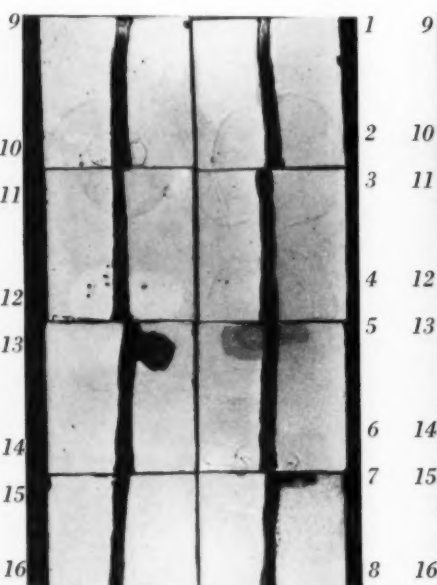
1300° F.—The cover coat displayed considerable fusion and a gain of opacity.

The three figures below show test pieces beaded with 50% saturated solutions and fired for 3 minutes. The key to the numbers on the sides can be found in Table 4.

FIGURE 11—Zircon enamel.

FIGURE 12—Titanium enamel.

FIGURE 13—Antimony enamel.





The line of discoloration was more opaque than the cover coat. The tear lines between the cover coat and the line of discoloration were more rounded off.

1400° F.—The cover coat displayed an increased amount of fusion and a gain of opacity. The line of discoloration was more opaque than the cover coat but the degree of difference was less. The tear lines became less apparent, but they were still evident. Large bubbles were present in the line of discoloration.

1450° F.—The cover coat was completely fused and displayed the maximum amount of opacity for the series. The line of discoloration was less opaque than the cover coat; this loss in opaci-

**Table 3.**  
**Concentrated Solutions**

- (1) Sodium carbonate
- (2) Boric acid
- (3) Sodium fluoride
- (4) Sodium silicate
- (5) Potassium silicate
- (6) Sodium tetra borate
- (7) Sodium nitrite
- (8) Potassium carbonate

ty can be attributed to the increase in the size and number of large bubbles. The tear lines were less apparent but they were still evident.

1500° F.—The cover coat was overfired and lost some of its opacity. The line of discoloration lost practically all its opacity, because of the large number of very large bubbles. The tear lines completely disappeared.

In the series of titanium enameled test pieces heated at a specific temperature for one hour (Figure 4), the results were as follows:

Dried—The line of farthest penetration of the beading water displayed a slight discoloration (light brown).

1000° F. — The line of discoloration changed in color to a brownish-grey and displayed a slight amount of fusion.

1100° F.—Very similar to the test piece fired at 1000° F., except that a slight amount of tearing between the cover coat and the line of discoloration was apparent.

1200° F.—The cover coat fused sufficiently to lose some of its opacity and the line of discoloration was slightly more fused displaying a greyish color. Tearing was evident all over the piece.

1300° F.—The cover coat displayed considerable fusion and a slight gain in opacity. The line of discoloration was more opaque than the cover coat and was slightly off color, being a greyish-brown. The tear lines between the cover

coat and the line of discoloration were more pronounced.

1400° F.—The cover coat was well fused and displayed good opacity. The line of discoloration was of about the same opacity as the cover coat, but of a greyish color. Large bubbles are apparent in the line of discoloration. The tear lines between the cover coat and the line of discoloration virtually disappeared.

1450° F.—The cover coat was completely fused and displayed good opacity. The line of discoloration was less opaque than the cover coat, because the large bubbles increased in number and size, in some places extending to the ground coat. The tear line between the cover enamel and the line of discoloration disappeared.

1500° F.—The cover coat was completely fused and showed good opacity. In the line of discoloration the number and size of the large bubbles increased, many of them extending to the ground coat giving the waterline area a bluish color.

This thermal study indicated that the line of discoloration was one of increased bubble structure. The differences seemed to be in the amount and the sizes of the bubbles and these bubbles must have found their source in the concentration of salts in that region.

#### Aging studies

In a study of the effect of aging, both enamels displayed waterlining under all conditions of aging. The enamels that were applied directly

**Table 4.**  
**50% Concentrated Solutions**

- (1) Sodium carbonate
- (2) Boric acid
- (3) Sodium fluoride
- (4) Sodium silicate
- (5) Potassium silicate
- (6) Sodium tetra borate
- (7) Sodium nitrite
- (8) Potassium carbonate
- (9) Magnesium carbonate
- (10) Barium hydroxide
- (11) Sodium aluminate
- (12) Magnesium sulfate
- (13) Ammonium carbonate
- (14) Barium chloride
- (15) Silicic acid
- (16) Distilled water

from the ball mill gave the least amount of waterlining. The enamels that were aged for two days displayed an increase in the extent of the waterlining over the enamels applied directly from the mill. There was no noticeable increase in the severity of the waterlining of the enamels aged for one week over the enamels aged for two days.

#### Effect of different salts on enamels during firing

If it is true that the discoloration is caused by the concentration of soluble salts and if the actual phenomenon is one of forming bubbles in that region, more information should be obtained regarding the effects of

to Page 56 →

Shown below are photomicrographs of polished specimens through the line of discoloration of fired enamels.

FIGURE 14—Titanium enamel 17x.



FIGURE 15—Titanium enamel 54x.



## Enameled art prize winners at 30th annual Cleveland May Show



**A**T the Cleveland Museum of Art's 30th annual May Show, which ended June 13, the enamels exhibited were acclaimed as surpassing any before exhibited in the event.

First Prize in the class of mural and decorative art in any medium was awarded to Edward Winter for his large enameled metal mural, "Rhythms in Gold" (*below*).

In the enameling-on-metal class, the Special Award was won by Jo

Natko, a young woman new to this field of art. Her three bowls (*above left*) have a leafy quality and the colors have the dull richness of the last of autumn foliage.

First Prize in the enameling-on-metal class was awarded to Doris Hall for her group of seven objects which included a "Blue Tail Fly" platter (*above right*). Kenneth Bates was awarded Second Prize in this class with four objects, including a

pair of candlesticks made of a series of planes in a beautiful blue. Edward Winter won Third Prize with three bowls. Honorable Mentions went to Charles Bartley Jeffery, Anthony Vaiksnoras, Mildred Watkins, and Claire Wyman.

In the jewelry class, Doris Hall also won First Prize for a group of richly enameled objects; Jo Natko was awarded Second Prize for an enameled bracelet and necklace.



Illustrating the versatility in design possible with architectural porcelain enamel is this theatre front installed in Dallas, Texas, by Texlite, Inc.



## The growing acceptance of architectural porcelain enamel

By *M. J. Patton* • PRESIDENT, SEAPORCEL PORCELAIN METALS, INC., LONG ISLAND CITY, N. Y.



Comparatively new from the standpoint of years of service, architectural porcelain enamel has developed in use and acceptance with amazing rapidity during the past ten years. Taking into consideration the inactivity in this field

during the war years, the present prevalence and future potential of architectural porcelain enamel is even more significant.

This is particularly significant since curtailed production during the war years rendered the supply of architectural porcelain enamel almost nil. Notwithstanding this, one can rarely walk down a street in a

busy city without encountering signs and store fronts which evidence the growing acceptance and future potential of architectural porcelain enamel.

To view this favorable condition in its proper perspective, there are a number of relevant facts which must be considered. Since the war, steel shortages have confined the fabrica-



*The beautiful simplicity of this store front in Wichita, Kansas, was achieved with architectural porcelain enamel. Installation was made by Porcelain Products Co.*

tion of architectural parts to a small number of companies, and competitive materials have been scarce, high in price, and slow in delivery. And yet, in this same picture, is a tidal wave of construction-demands finally breaking through the rigid confines of wartime economy. Confronted with these demands which "will not wait," architects and designers are turning to porcelain enamel and finding it a durable and appropriate material for modern buildings.

While helping to build a large market for porcelain enamel, these typical post war trends tend to confuse the value of the sales figure as a barometer of actual development and an indicator of future demand. In order to bring the status of architectural porcelain enamel into perspective for consideration, and in order to insure sound and rapid growth for the industry itself, these inflationary influences must be lopped off to lay bare the fundamentals from which reasonable conclusions may be drawn.

#### **Physical growth**

Initially, porcelain enamel was found to be ideal for bulkheads on store fronts. Its successful use in this application prompted the gradual adoption of porcelain enamel pilasters or piers, followed by an

entire porcelain enamel fascia area, and the almost endless variations made possible by stenciled and raised letters, signs, and designs.

Development in the "store front" field was most conspicuous during 1937 and 1938 when the complete all-porcelain enamel gas station constituted a major portion of all architectural porcelain enamel used. Spurred by success in that field, progressive manufacturers began to consider a larger market for porcelain enamel. By 1942, mural displays began to appear, and it was not unusual to see porcelain enamel installed on buildings above the first story. These same applications were characteristic of the immediate post war period, with only sporadic attempts being made to encroach on newer fields.

#### **Design**

Simplicity was the keynote of the first porcelain enamel applications. But along with advancement of physical locations for the material in succeeding installations, intricate designs and shapes began to appear.

#### **Quality**

Crudeness is the best expression that can be ascribed to early architectural porcelain enamel, and quality improvement of the product was gradual. Each year saw a few manu-

facturers developing their product and taking pride in public acclaim of their installations. Fortunately, the predominance in the enameling field of forward-looking manufacturers has minimized the turn out of an inferior product, and steady quality improvement has afforded the industry a healthy growth.

Because of unsettled conditions and the lack of coordination in industry, the post war quality of porcelain enamel, like that of many other materials, was obviously inferior. However, in the past year, a tremendous improvement in quality is plainly discernible. And it is this policy of continuous improvement which has caused architects and builders to look to porcelain enamel as a future class A building material.

#### **Installation**

Architectural porcelain enamel, unlike a finished product such as an automobile, has no value upon possession until it is installed on the building for which it has been fabricated. The history of porcelain enamel installation has been marked by indifference, chaos, union squabbles, allied trade ignorance, and varying product qualities. Everyone seemed to have had a hand in "putting up" porcelain enamel. Some companies relied on others to install, while a number handled their own erection.



The large amount of porcelain enamel being sold eventually qualified many workmen in various trades to make installations. But no sooner had this adjustment begun to work than unions restricted the activities of workmen, with the result that installation of architectural porcelain enamel went sky high. Only specified trade groups could be utilized, and the supply of competent men became a vital consideration.

This problem heads the list of "things to be done" in the enamel industry. However, many companies have satisfactorily dealt with this difficulty by establishing installation departments of their own or by enlisting the services of fellow companies to install their product.

The major difficulty resulting from this haphazard labor set-up is the inability to establish basic requirements for such necessary accessories as caulking, furring, and attachments. The standard of acceptance varies from place to place and from job to job—an unfortunate circumstance for such a rapidly expanding industry.

#### Building codes

Old, inflexible building codes have offered very little assistance to the development of architectural porcelain enamel, and, to date, negligible progress in modernization and coordination has been made.

The natural result of such a multitude of changing regulations was an undesirable variation in job quality. This, of course, tended to becloud the impression of porcelain enamel as a dependable construction material. Here again there has been encouraging post war activity directed to clarifying this unsound situation.

#### Advertising

The growth of almost all large industries in the United States have been paralleled by a corresponding growth in trade advertising. Early advertisements of architectural porcelain enamel were of elementary approach and, treated as a whole, advertising efforts in the industry made very little progress before the war. Only isolated attempts, small in number, were made by a few leading and progressive companies. And yet, the growth of the architectural porcelain enamel field certainly warranted an industry-wide effort to educate the public as to the product's value as a building material.

#### Sales organizations

The economic law of supply and demand influences the degree and character of development of individual sales organizations.

Coinciding with the Topsy-like growth of architectural porcelain enamel, we find widely varied types of

sales set-ups. Uncertainties and lack of confidence in the product's eventual success, together with its small part of the industry's total production, combine to develop today's lack of uniformity in sales approach.

Today we still find agents, distributors, company salesmen, combinations of the foregoing, and in a number of cases the executives themselves, undertaking individual sales. Sales efforts of various companies cover territories small and large, criss-crossing each other in such a manner that no pattern of sales approach is discernible.

#### Policies

Policies are very uncertain; no trade distinctions are being accorded various classes of consumers such as large or chain purchasers, individual owners, general contractors. Each company seems to have a sales policy flexible enough in scope to permit the capture of individual jobs, rather than a sound long term plan designed to place the industry on a true merchandising sales plan of distribution.

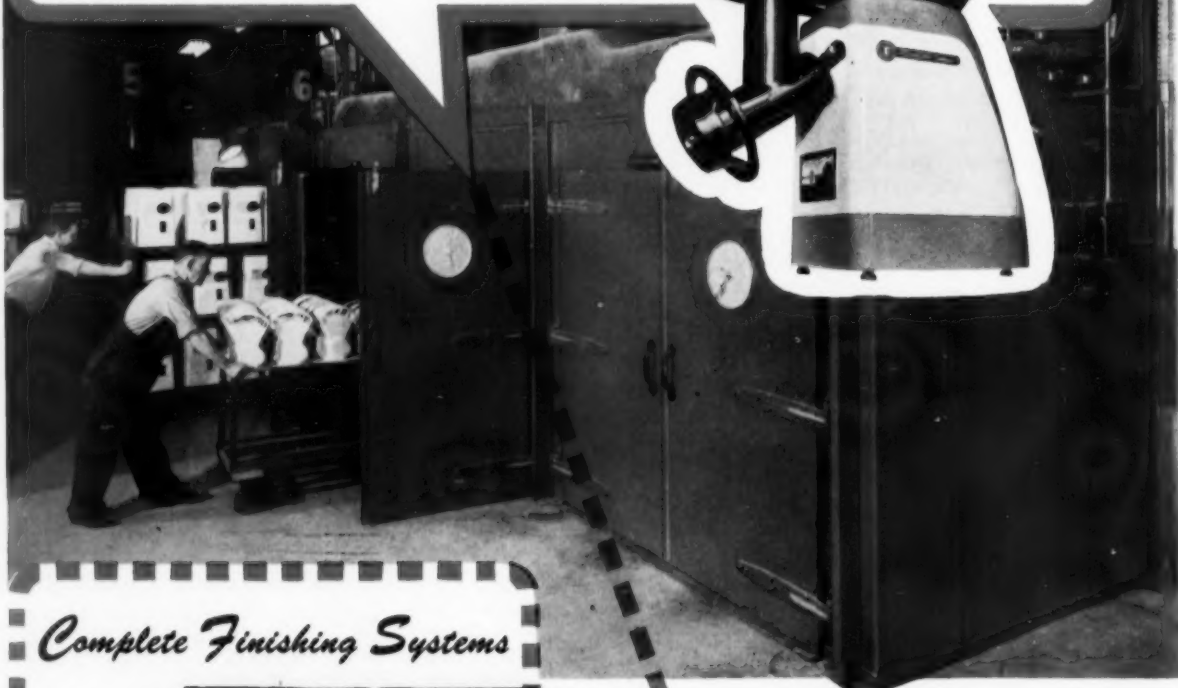
The post war era has not greatly changed the general pictures and so far as the sale of architectural porcelain enamel is concerned, it may be said that the industry as a whole does not have a really organized and planned sales scheme or the adequate

to Page 58 →

*This Shell installation is one of many hundreds of all-porcelain enamel service stations that now dot the streets and thoroughfares of the country.*



"Bakes Pure White Enamel Uniformly"  
Says Toledo Scale Company



### Complete Finishing Systems

Continuous conveyor oven for baking finishes on oil burner parts.



Overhead monorail conveyorized system for finishing home freezer cabinets.

### Now Adds New Mechanized Rustproofing System

Without discolorations or other defects, the Toledo Scale Co. has baked white enamel finishes with efficient and economical, direct gas fired Despatch heaters for three years. As manufacturers of precision scales and food processing equipment, they have expressed complete satisfaction with their Despatch 3-section oven.

Recently, Toledo Scale added a mechanized Despatch rustproofing system which has further speeded production, reduced man hours, cut costs and boosted quality and uniformity.

Such success is typical of the 50,000 heat processing installations designed and built by Despatch over the last 46 years. Despatch engineers are ready to serve you in all principal cities.

Write today for finish baking bulletin No. 51

#### DISPATCH OVEN COMPANY

Minneapolis Office:  
619 E. E. 8th Street

Chicago Office:  
211 N. LaSalle Street  
Offices in All Principal Cities

**DISPATCH**  
OVEN COMPANY

# Heater shipping weights reduced 40 pounds

how a ninety-nine year old stove manufacturer improved packaging methods to save time, shipping weight, and reduce shipping damage

THE story of the conversion of packaging methods by a ninety-nine year old stove manufacturer is told by Donald P. Morris, general superintendent, Indianapolis Stove Company, who states that the change-over in crating methods has cut in half the time required to package a heater and also has resulted in substantial savings in tare weight. The latter feature has distinct money saving and public relations value by reducing freight charges paid by dealers handling the Indianapolis line of heaters, which are shipped F.O.B. Indianapolis.

The company, which is headed by Garvin M. Brown, president, and E. J. Bennett, secretary-treasurer, manufactures coal-burning heaters of up-to-the-minute styling and technical design. Two of their important prod-

ucts—Indianapolis kitchen heaters and Duo-Nubian and Glow Boy space heaters, all coal burners—are

porcelain enameled, and are sold from coast to coast through hardware and furniture stores.

In shipping these porcelain enameled products from coast to coast, the company was faced with the same problems that have caused concern among many of the leading appliance and metal products producing companies—that of the proper packaging for safe delivery of the finished product to users when shortage of vital materials adds a new importance to losses resulting from shipping damage.

The latest forward step by this veteran company, which was founded in Indianapolis in 1849, was to revolutionize its packaging operation. Following a study of crating methods, the company eliminated its own crate making department and converted to

## Editor's Note:

In The Finish Line for July we called attention to the serious problem of damage to finished products in transit due to the laxity in crating departments, poorly designed and poor grade crating and shipping materials, careless loading of cars or trucks, improper handling by carriers and, in some instances, poorly designed merchandise. Coordination of the work of the many finished product manufacturing groups was urged.

The response to this editorial has been gratifying, and as a constructive step we plan to publish a series of articles relating to the problem of packaging and shipping. This first article is a brief case history pertaining to a specific product.

*A porcelain enameled Duo-Nubian space heater is lowered onto the base of a wirebound crate after coming off the assembly line of the Indianapolis Stove Co. In the background are stacked flattened crate sides and leaning against them are several crate tops. The white tape holds doors closed during shipment.*







*works like Magic*

**IN CLOSING RANGE SALES**

You add a real *plus* feature to your ranges that rings the bell with Mrs. Buyer when you include the TK Monotube as standard equipment. The exclusive swivel-arm and single tube construction are easier to sell than to sell against.

The unit can easily be moved to an upright position—even when hot. Spilled foods no longer need be left in the pan, to smoke and

harden, until the unit is cool. *Greater heating efficiency and longer life* are assured by the monotube. *Faster Cooking* results from the increased utensil-contact area. *Lower Cooking Costs* are assured year after year—the heating element stays *flat*, maintains its original efficiency during the life of the unit. *The Monotube is a feature you can SELL.*

*the* **T-K** **MONOTUBE** *It stands alone!*



**TUTTLE & KIFT, Inc.**

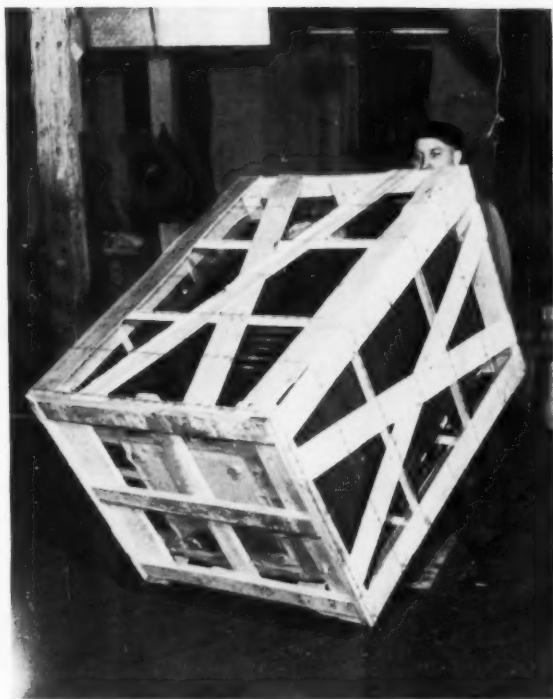
1823 N. MONITOR AVE. • CHICAGO 39, ILL.







*With space heater firmly placed on the crate base, the light-weight wrap-around crate sides are folded into shape and placed into position by one man.*



*Completely packaged for what may be a long and rough journey, the space heater takes its first ride from packaging room to the shipping room.*

manufactured crates scientifically engineered to carry the porcelain enameled heaters to their destination. According to Mr. Morris, the shipping weight of the kitchen heater has been reduced through the use of the new crates from 225 pounds to 200 pounds, or about 11 per cent. The present shipping weights of the larger Duo-Nubian and Glow Boy space

heaters are, respectively, 600 pounds and 625 pounds—a reduction of 40 pounds each from the shipping weights when the company made its own containers.

"The greatest saving of all," Morris said, "is that in the time needed to crate the heaters. That has been cut approximately in half as a result of the ease of assembling the

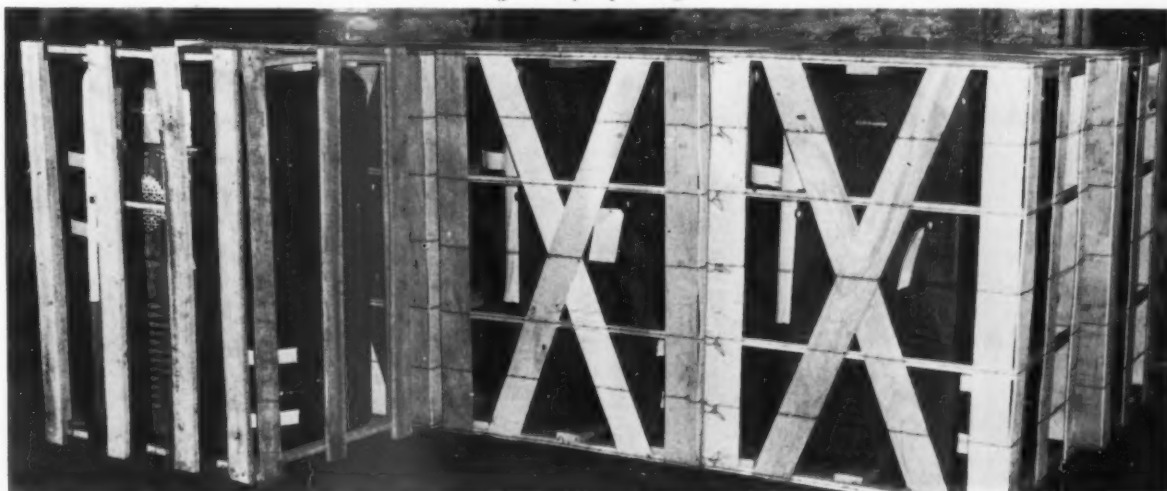
crates, 'wrapping' the heaters in them, and closing them. Only one man is required to do the job."

#### **Packaging method**

Before leaving the assembly line, all doors and movable parts on the heaters are securely taped to prevent movement of the parts. As a heater

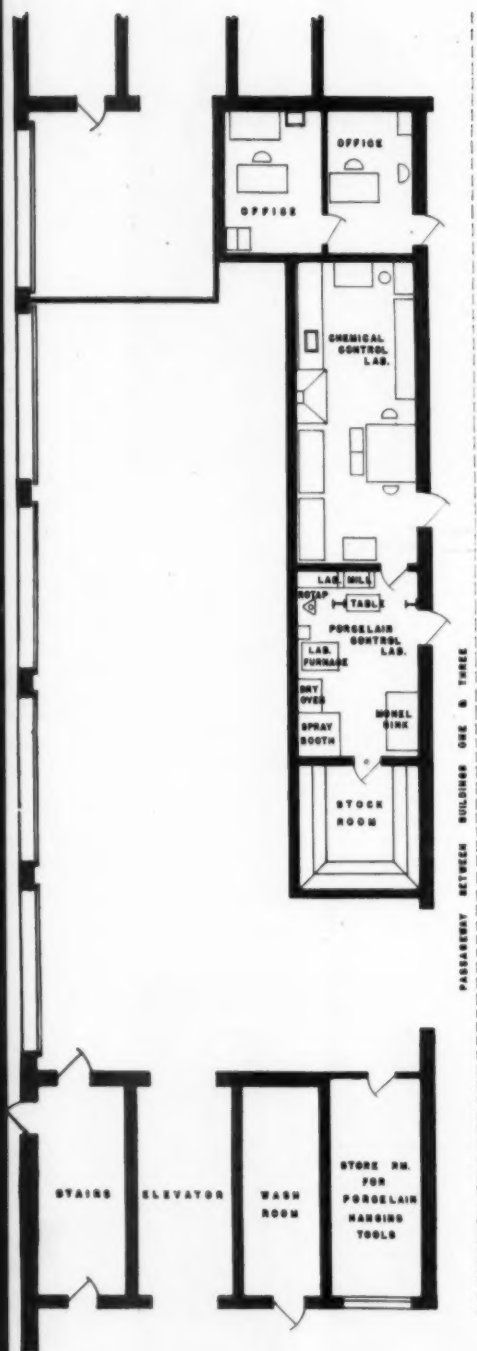
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*To the left is a porcelain enameled Glow Boy space heater in a crate of the type formerly made by the company. Heaters at the right represent the new type packaging now employed to save time and weight and to afford safer packing.*

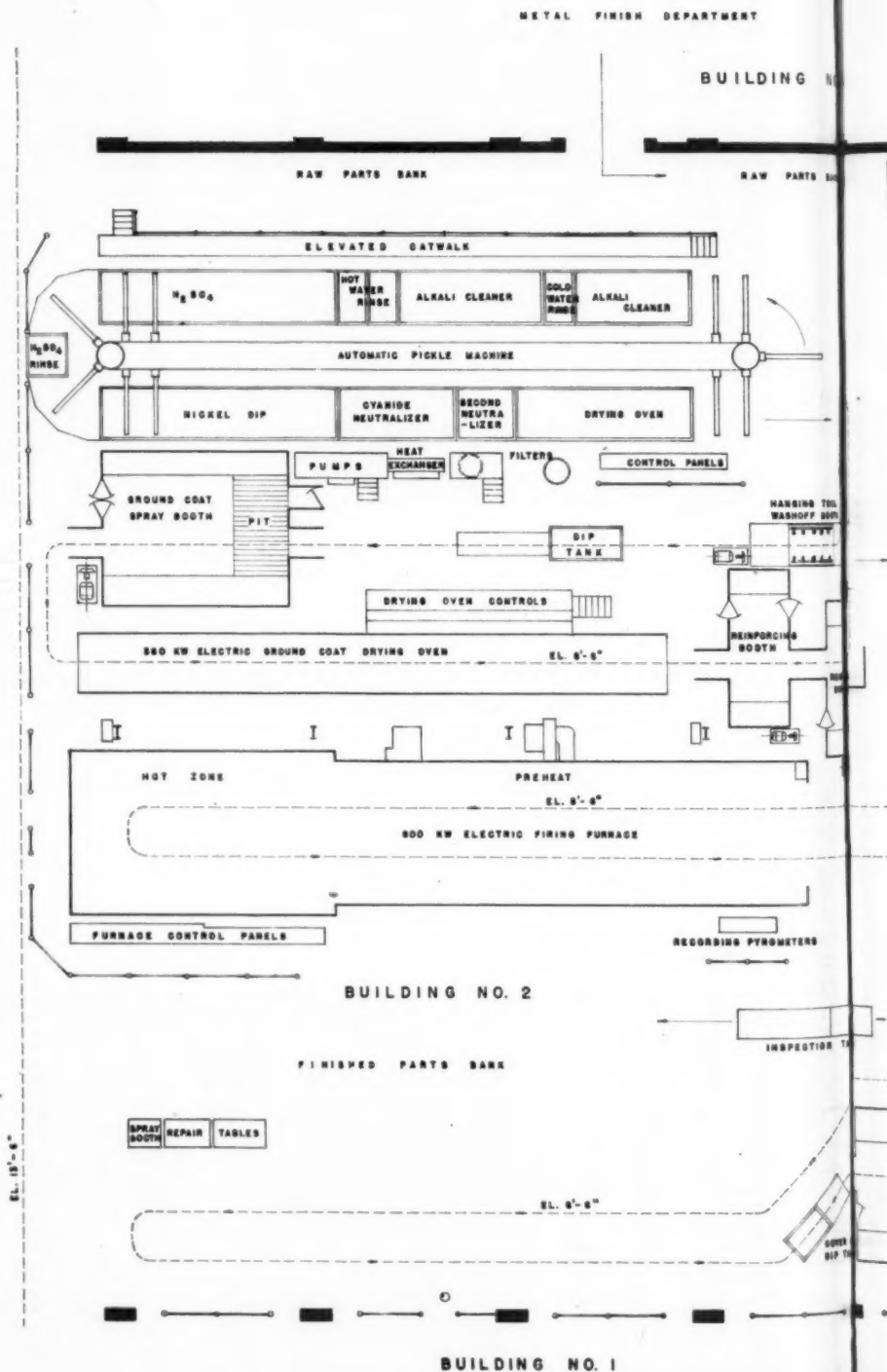


# Plant layout No. 12 . . . . .

A continuous furnace enameling plant



PASSAGEWAY BETWEEN BUILDING ONE & THREE



METAL FINISH DEPARTMENT

BUILDING NO. 2

BUILDING NO. 2

FINISHED PARTS BANK

BUILDING NO. 1

(Plant description)

any major appliances

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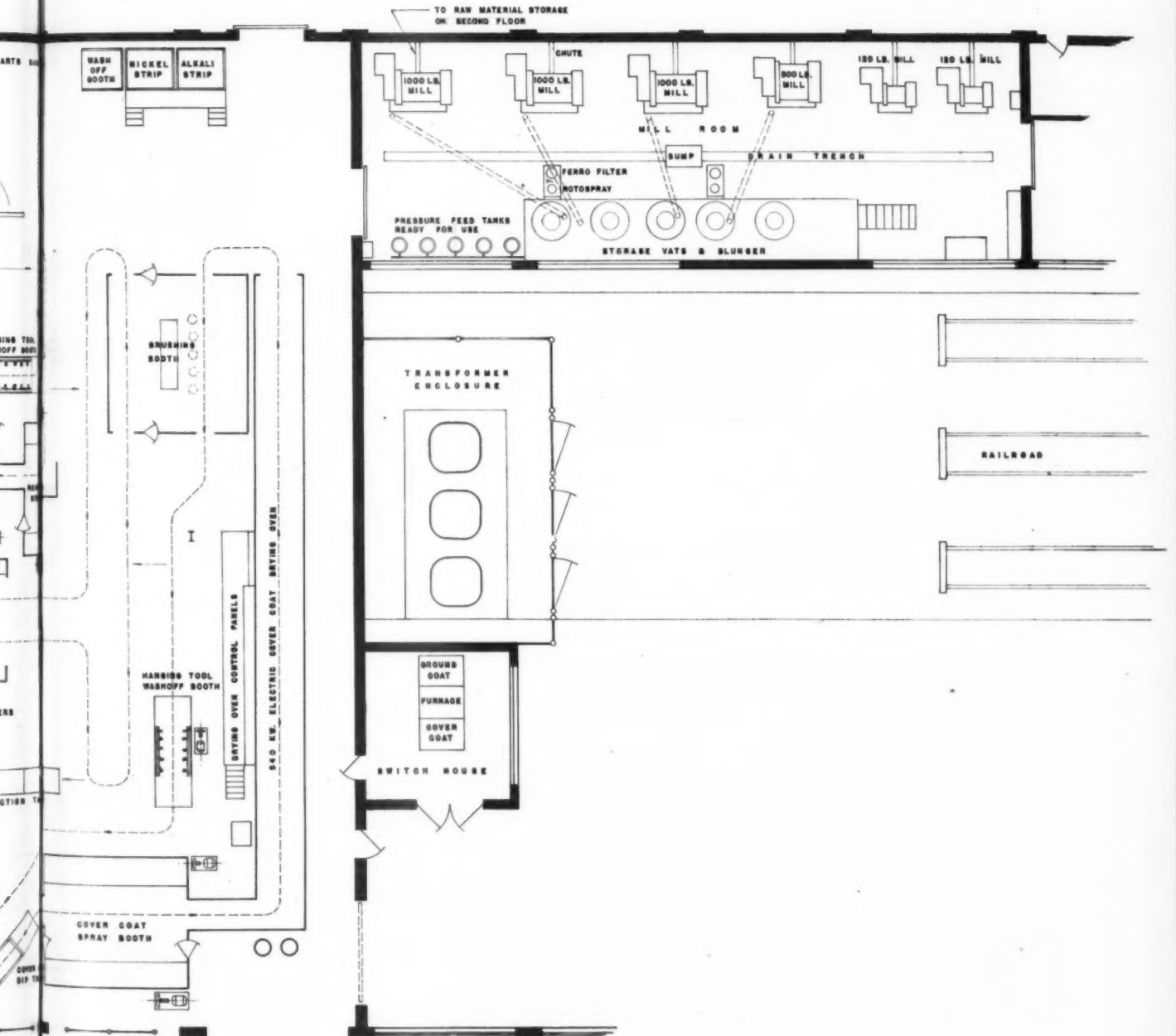
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tionarts on page 19)

finish AUGUST • 1948



DEVILBISS  
THE *New* AGA

TYPE  
AGA

## Specially suited for CUTTING PORCELAIN ENAMELING COSTS

• Every feature of this completely new DeVilbiss Type AGA Automatic Spray Gun has been engineered to bring greater speed, higher efficiency and still greater economy to all automatic porcelain coating operations.

Here is an automatic gun adaptable for porcelain and ceramic finishing on either automatic or semi-automatic machines. The ease with which the AGA can be mounted—the accuracy with which it can be controlled—and its ability to produce fine, uniform spray

patterns, make it the ideal automatic spray gun for any type machine or fixture. Vital points subjected to severe wear are fabricated from special metals to withstand the abrasive action of vitreous materials.

All the qualities which mean high finishing efficiency for long periods are incorporated in the new DeVilbiss AGA. Your DeVilbiss engineer will gladly show you how these features can increase production, improve product quality and lower operating costs.

# DEVILBISS

means Quality in all four..



SPRAY EQUIPMENT  
EXHAUST SYSTEMS  
AIR COMPRESSORS  
HOSE & CONNECTIONS



# INTRODUCES AUTOMATIC SPRAY GUN

*with 15 distinctive advantages*

1. Wear points built to withstand abrasion.
2. New air caps, perfected for ceramic materials produce finer finishes.
3. Removable spray head for quick, easy change-over of materials.
4. Easily mounted—retains its set position.
5. Split second starting and stopping eliminates lag.
6. Instant atomization—no dripping—no sputtering.
7. Easy to clean.
8. Built-in air valve provides surest and most simple air control.
9. Large capacity meets heaviest production requirements.
10. Easily adjusted and stays adjusted for uniform application.
11. Simplified design, minimum number of parts assures long life and less maintenance.
12. Positive piston action provides instant response.
13. Compact for convenient group mounting.
14. Easily serviced.
15. Universal clamps and extensions provide flexibility in mounting.

**THE DEVILBISS COMPANY • Toledo 1, Ohio**

Canadian Plant: WINDSOR, ONTARIO



# Visual system of control

board type of control conserves time by providing visible index of items

*By Jonas Howard*

**O**RDER scheduling in the finishing trades becomes of increasing importance in times of "shortages" and other operating "pressures." As a rule, book or paper records require time to coordinate all factors which help or hinder orders going through the finishing shop. To provide a day to day picture of the progress of orders, The American Abrasive Metals Company, Irvington, New Jersey, has adopted the visual (board) system of control.

This is the type of control devised and developed during the war to speed up production and to expedite other wartime activities. Its purpose is to project most important factors in the production process so that management and the production head can, at all times, see at a glance what is going on."

## Advantage of flexibility

It is said that the flexibility of the visual control technique is the primary advantage over paper and book records. That is, the time of both clerk and executive is conserved. The abrasives industry certainly has had to keep a sharp eye on the production line since the close of the war and shortages have continued in many instances to plague management.

Not only does the production man get the picture of order progress but other departments involved, sales for instance, can keep posted on the status of orders in the works.

The visual control board used in this case is simple, and can usually be operated by an intelligent routine office worker. The flexibility of the method will be realized from the following description:

A visible index is located at the

left side of the board. It is used to hold the permanent card records of the items or elements under control. There are 100 card pockets on each panel. A legend is located at the top of the board, and is used to show the meaning of the pegs and cords.

A peg hole section is placed on the main body of the board—for the purpose of visibly analyzing information on the cards by means of the pegs and cords. A heading strip is attached across the top of the peg hole section—to reveal quantity and/or time represented by peg holes from left to right. There is one tape peg for each item in the visible record panel, and each is numbered to correspond with the card pocket (at its left). Each peg is attached to a cord which pulls outward from the board so that it may be extended from left to right on the board as needed.

The signal pegs are to be located, according to procedure, in the vari-

ous peg holes, their meaning being noted on the legend at the top of the board. The "today line" is attached vertically to the board and is moved periodically from left to right in accordance with the time element in the procedure.

## Knowledge of pertinent facts and figures at a glance

Thus, in making it possible to exert control in this kind of an operation, a visual method such as this offers certain definite advantages. It provides, at a glance, a knowledge of all pertinent facts and figures, eliminates from the executives' attention situations which are in a normal condition, spotlighting the bad points and thereby reducing, immeasurably, the amount of time necessary to make an analyzed report.

It flashes the facts to all interested parties at one time, is flexible and

to Page 70 →

*The production man can immediately get a picture of order progress.*



AUGUST • 1948 finish

# LET US HELP YOU WITH THAT LOAD, PARDNER!



Your Problem  
is our Business,  
Especially if it's—

## FUNCTIONAL MACHINED BRASS CASTINGS (Valves, Fittings)

Maybe you have a problem!

Maybe it's the design or the production source of a brass casting—a casting, let's say, that's to be functional and will need to be machined. Yours may be a standard article or possibly may be a special item calling for depth and breadth of knowledge in casting brass. It may be a valve or a fitting that needs the attention that only half a century of experience will satisfy.

There, Pardner, is where we come in! There's where we can really take a load off your shoulders. Rely not only on our long experience

and straight-line reputation in working in brass, but place your confidence in our expanded Research and Development department whose business it is to tackle the difficult problems and come up with the right answers for you and for us. Rely, too, on our sales engineering representatives to be at your doorstep in a jiffy to advise on a problem—this without cost or obligation, of course.

Your problem is our business—make it your business to bring your brass casting problems to us. We have succeeded in pleasing many customers over many years, and very likely we may have something to offer you.

### DETROIT BRASS & MALLEABLE WORKS

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OUR SERVICE TO OTHERS is the best indication of what we can do for you. Some of the industries for which "Detroit Brass" has produced functional machined-brass castings in volume and variety—always on the same top-quality level:

Agricultural • Aircraft • Automotive • Beverage  
• Cooking • Diesel Engine • Dry Cleaning •  
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ment • Locomotive • Maritime • Milking  
Machine Equipment • Oil Refining Equipment  
• Oil Heating Equipment • Plumbing • Refriger-  
ation • Rubber • Spray Equipment • Washing  
Machine • and others.

# Production of commercial and reachin refrigerators

applying zirconium cover coat direct to titanium steel

By *M. E. McHardy* • SUPERINTENDENT, ENAMEL DEPARTMENT, HUSSMANN REFRIGERATOR CO., ST. LOUIS, MISSOURI



After observing the Progress Reports of the range industry as presented in the April and May, 1948, issues of *finish* concerning the advancement of titanium bearing killed steel, it may be of interest to present the progress of titanium steel as used in the manufacture of commercial and reachin refrigerators and applying cover coat enamel directly to the base metal.

In 1945, Hussmann Refrigerator Company welcomed the exploitation of titanium steel in conducting an experimental development program and as a possible means of overcoming a production problem by producing one coat, one fire, two piece

interior liners for 27, 40 and 65 cubic foot reachin refrigerators. Design was changed to help the cause and gas welding eliminated in favor of spot welding where welding was necessary and production of one coat, one fire, cover coat direct to steel, liners was started in 1945.

## A PROGRESS REPORT

Problems were numerous and considerable time and money was spent to develop the program. Since that time, one piece liners for 16 and 25 cubic foot reachins are in production. The sag resisting properties of the titanium steel are beneficial in keeping open flanges straight during and after firing.

The use of titanium steel has since

been extended to the manufacture of certain interior commercial refrigerator parts and also to 7 and 10 foot exterior top and front panels. However, as a matter of quality and size being a factor, the exterior parts are presently being processed in two coats on the face side. A solid sec-

ond coat of acid resisting enamel is applied to the exterior tops.

The development so far has employed the use of zirconium cover coats with the exception of the acid resisting enamel applied to the exterior top panels.

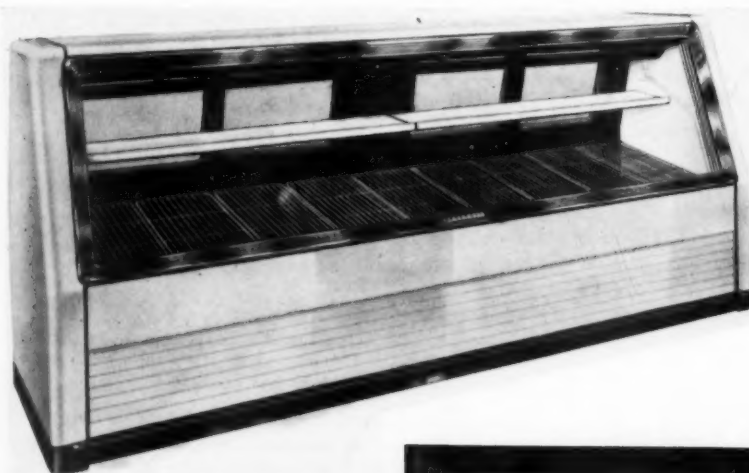
The fired thickness of the interior liners and interior commercial parts is normally between .005 and .007, while the two coat exterior parts will run between .008 and .010. Booth reclaim is used as much as possible on the interior and as a first coat on exterior parts.

The use of titanium enamel as an acid resisting one coat, one fire finish on exterior top panels has been limited to experimental stages only. Some one coat, one fire, 10 foot exterior top panels have been produced at a fired thickness of .004 to .006.

Production is accomplished on gas fired, radiant tube, box type furnaces requiring a temperature of 1550° F. to 1560° F. in order to produce a satisfactory finish. This applies to zirconium cover coats as well as titanium enamels which will fire out along with the regular cover coats.

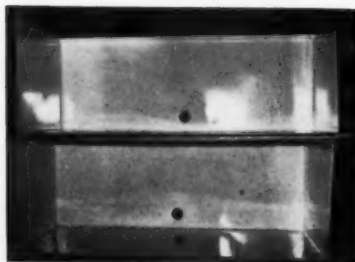
The batch type pickling cycle presented in the previous article (*"How We Answered the Problem of All-White Gas Range Tops,"* May, 1948

to Page 62 →



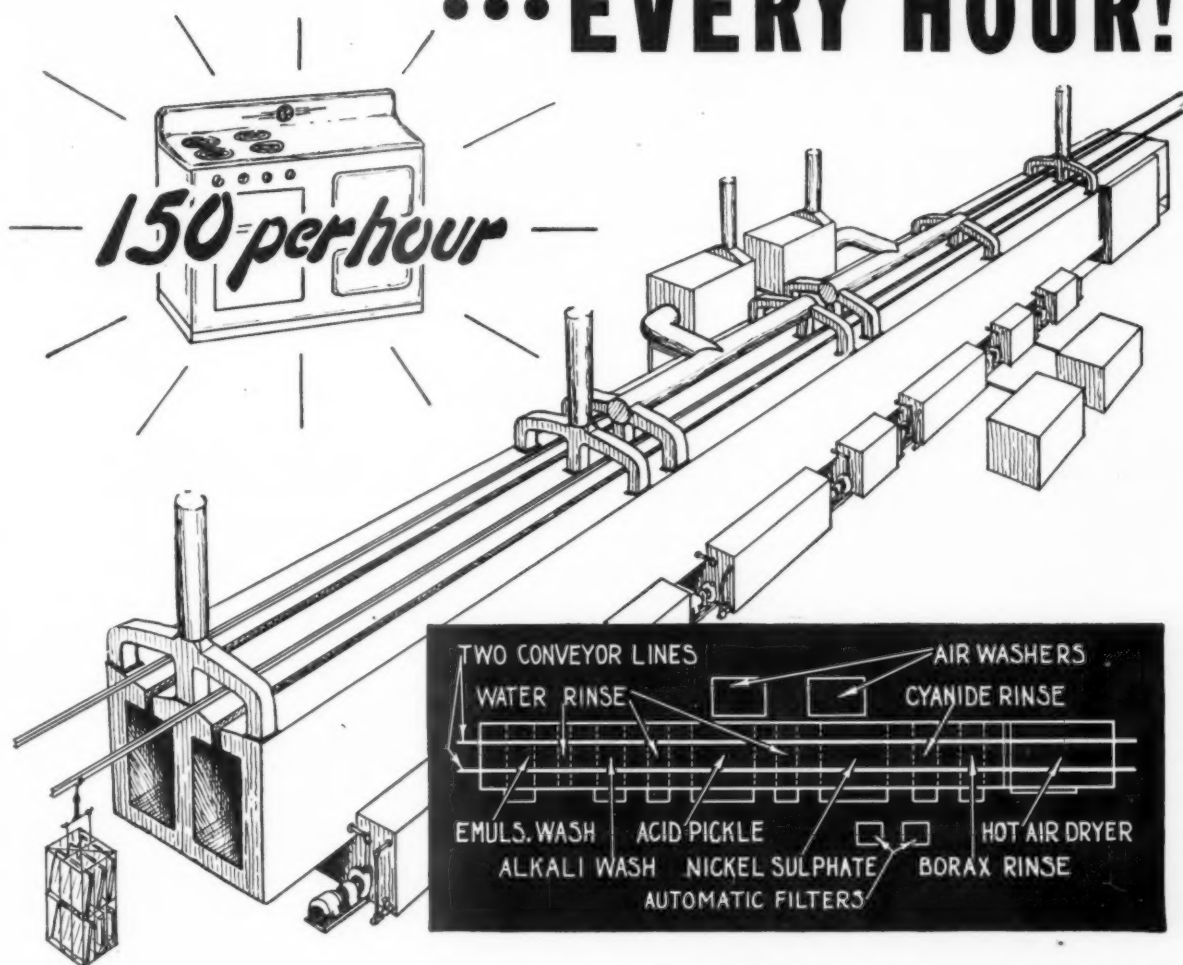
Above: Ten-foot counter case showing exterior top and front panel and interior end on which cover coat was applied direct to steel.

Right: Lower section of a two-piece reachin interior liner with cover coat applied direct to steel.





# PICKLING 150 RANGES... ...EVERY HOUR!



This sketch illustrates a METALWASH continuous Spray Pickling Machine, now in operation in the plant of a leading manufacturer of kitchen ranges. In the preparation of steel range bodies for porcelain enameling, this machine processes over 150 range bodies per hour — taking them through the cleaning and pickling cycle shown on the diagram.

This type of continuous spray pickling equipment provides a clean, nicely etched surface, properly nickel coated, producing greatly improved adherence qualities and better porcelain enameling. Fully automatic operation reduces handling, increases production and permits accurate control of time cycles and temperatures. The closed venting system eliminates obnoxious fumes and vapors.

METALWASH is the leader in the design and manufacture of ENGINEERED continuous spray pickling equipment. Let us help you. Write for further information.

**METALWASH MACHINERY CORP.**  
149 - 155 SHAW AVENUE IRVINGTON II, NEW JERSEY

# Summer homefurnishings market

general survey of new trends, products and market conditions revealed at market

**T**HE homefurnishings industry has practically returned to normalcy. This was evident to the reporter who visited The Merchandise Mart and the American Furniture Mart in Chicago during the summer market period, July 5-17.

There was no mad rush in buying. Visiting buyers unhurriedly studied the products offered by manufacturers of major appliances, household equipment and furniture.

More fresh, new, salable models were shown than at any time since the prewar markets. Values were greater and designs were plentiful. A number of appliance manufacturers displayed working models of new products which are just being put into production, or will be in production by fall. Even though there still exists a big demand for homefurnishings, the summer market was a buyer's market in the sense that quality and prices dictated which products received the most attention.

## Consumer buying power

The consumers' buying power was tied in with business prospects by J. I. McMahan, president, National

Retail Furniture Association. "The designers and stylists and manufacturers are continually whetting the public appetite for home goods, and we must make good quality merchandise available at a price the customer can afford to pay," stated McMahan—adding, "If you can't find what you want, demand it from the manufacturer. We can increase business 20% if we can meet consumer demand."

Because of the tightening of the steel situation, manufacturers urged buyers to anticipate their requirements further ahead. Announcement of price increases for some of the more important appliance lines caused buyers to reappraise the situation in light of the third round of wage increases now nearing completion. It affects their inventory position, turnover, and public acceptance to such an extent that policies are difficult to determine.

Industry representatives furnished members of the press with a view of business conditions and trends at a press conference at The Merchandise Mart.

Concerning the steel situation,

Birch Vermillion, sales manager of Knapp-Monarch Co., said, "Our steel situation is not too good. We feel we'll be able to get through this fall, but it's going to be a tight squeeze. . . . We feel there will be shortages in small appliances." He added that prices will go up somewhat in "all small appliances because of the manufacturers' increased costs."

## Color in kitchens?

In answer to a question on colored cabinets in kitchens, A. D. LeMonte, public relations director, Mullins Mfg. Corp., pointed out to the publication representatives that "from a view of future decorating, or resale of your home, a colored cabinet will be a very definite liability. . . . If you have a green kitchen and the lady you want to sell your home to doesn't like green, you're stuck." Mullins is going to continue making white kitchen cabinets, stated LeMonte.

## The appliance market

The press men were told that the appliance market was very good. According to C. H. Foulds, vice president, Perfection Stove Co., "The space heater market seems to have no limitations as far as we can determine, except the possibility of getting fuel."

Another appliance which is having great consumer acceptance is the electric home freezer. "About 800,000 freezers will be sold this year. That is a \$160,000,000 business," stated Bill Conley, sales manager of The Coolerator Co.

## General survey of homefurnishings industry

A general survey of the homefurnishings industry for the entire year was given by Henry P. Draper, managing director, Home Outfitters, Inc., at a press luncheon at the American Furniture Mart.

"Early this year a doubt about

*Roy Douglas, ventriloquist, Eddie Westin, and a pretty model present "Kitchen Capers" in Westinghouse display at American Furniture Mart.*





*In their display space in The Merchandise Mart, Gloria Hunter demonstrates Hotpoint's new electric range with individually lighted pushbutton controls.*

business prevailed," said Draper, "but it developed, eventually, that the public demand for goods continued and merchandise has been moving off the retail floor at a fair rate.

"For the first five months, about 50 per cent of the homefurnishings retail establishments are ahead of the record breaking 1947 sales volume; about 10 per cent are even with a year ago, and about 40 per cent are showing a decline in dollar volume. . . ."

"For the last half of 1948," continued Draper, "there are conditions to consider with reference to business prospects. The European Recovery Program, plus our own rearmament plans, may develop a new period of scarcities. With many men again facing military service, it may strain the labor market. Raw materials in many cases are likely to be on an allotment basis. . . ."

"Most of us believe 1948 will have its headaches, but not a series of crises. . . . With the nation at work, demand for home goods remains unsatisfied. However, there is a growing feeling that price resistance is a factor to be reckoned with—that is a challenge to the industry. We believe there are signs in this market that the challenge will be met. . . ."

"Household goods prices, generally speaking, are expected to be firm in this market, and will remain steady during this market, but after that, as long as inflationary pressures continue, there is no telling how rising raw material costs and higher wages for labor will affect this situation in the near future," stated Draper.

*In the Norge space at American Furniture Mart, J. R. Winzey, left, and Harry Holbrook listen to recorded voice describe features of new Norge range, as parts of special stage model move automatically.*

*finishfoto*



### Change future market dates

Due to the holiday weekend preceding the homefurnishings market, attendance was down slightly and was spread out more evenly than ever before. To avoid holidays in the future, the Merchandise Mart management and the board of governors of the American Furniture Mart set new market dates for the next three years.

Following is a 3-year market date schedule: 1949—January 10 to 21, June 20 to 30; 1950—January 9 to 20, June 19 to 29; 1951—January 8 to 19, June 18 to 28. The dates are subject to review each six months, dependent on developments in those periods.

In making the announcement, which changes dates previously set, it was urged that all factors in the industry make immediate arrangements for hotel accommodations for the January market to insure proper housing. Later conflicts are not serious, it was explained.

### College students visit market

Among the visitors at the summer market were 20 college students on a "field trip." They were invited by the National Association of Furniture Manufacturers—which was re-

to Page 55 →



# The Washington round-up

*By Wilfrid Redmond*

**C**ONSUMERS of steel generally will get less steel and pay more for it, as a result of developments in the supply picture during the past 30 days.

Of greatest concern is the announcement of U.S. Steel, Bethlehem, and Youngstown that they will sell steel products F.O.B. mill or shipping point in the near future as a result of the recent decision of the U.S. Supreme Court holding that the basing point system is an unfair trade practice. This decision was made in the case of the cement industry.

U. S. Steel announced that, if the customer desires, steel will be delivered at prices including full transportation charges from shipping point to destination. This means that customers near the mills or shipping points will get a price advantage, and those at a distance will pay the freight. The new policy means complete abandonment of the practice of absorbing the freight in the delivered price.

It is a safe conclusion that the price of steel will be adjusted to that market area where the demand is heaviest. Consumers in the more remote sections will pay that price plus transportation charges.

Benjamin F. Fairless, president of United States Steel Corporation, said that hardships and dislocations to American industry may result from the action by his company, made necessary by the Supreme Court decision.

Economists who have been attempting to appraise the effect of the abandonment of the basing point system can see no other development than decentralization of Big Steel to meet the new pricing requirements. This will be expensive; it will cost the consumer money. Steel may also be expected in the immediate future to yield to the trend toward a general third-round wage increase and to a recent advance in the price

of coal, which will add up to a higher price for steel and an increase in the price of end products.

In announcing the new F.O.B. mill price policy, Mr. Fairless said: "The management of United States Steel believes that the systematic meeting of delivered prices of competitors is essential to the maintenance of competitive industry in this country and is of great benefit to many businesses, both large and small, throughout the United States. This practice of meeting competition through the absorption of freight is widely followed in American industry. Despite our serious doubts about the advisability and economic soundness of this radical change in our subsidiaries' marketing methods, we feel that we have no alternative other than to comply with the decision of the Supreme Court of the U. S."

But Federal Trade Commissioner Lowell B. Mason says: "Freight absorption is out.

"In my opinion, anyone who uses freight absorption, zone prices, or an individual universal delivered price system operates under the shadow of illegality and certainly is taking a calculated risk."

This shadow, Mr. Mason says, falls specifically on such industries as: chemicals and allied products, stone, clay, and glass products, non-ferrous metals and their products, and others.

About 82,189 manufacturers are affected and most of 36,763 companies in wholesale trade. The decisions on freight absorption, involving five cases which have been initiated by the Federal Trade Commission, will be of concern to 118,952 business enterprises, according to Commissioner Mason.

FTC, he states, can, under present procedures and present decisions, take orders against 100,000 businessmen.

At present, FTC is going ahead

with its complaint against the American Iron and Steel Institute and 101 steel companies charged with collusion and price fixing through operation of the basing point system.

The announced intention of FTC to move against all industries using the freight absorption pricing method will have its affect on a large part of the American economy. It will result in new price schedules and pricing methods of at least 22 leading industries.

## Steel supply

The steel price situation is probably of no greater importance than new factors in supply which will affect the consumer.

After Congress had gone home, it was found that the draft act contained two provisions which gave priority powers for the procurement of materials to the armed forces or other designated Government agencies. In the hurried hours at the end of the session, these provisions did not attract more than mention. It was pointed out that such priority provisions were in the draft laws of World War I and World War II, and were nothing new.

However, they were sparingly used because there were other authorities which could be applied that were more immediately effective.

Representative Ploeser of Missouri, a Republican, managed to get into the draft act a provision which empowers the President, through the Secretary of Defense, to require all producers of steel in the U. S. to make available to manufacturers who have orders for steel products of steel companies required by the Armed Forces, such percentages of the steel production of such producers in equal proportion deemed necessary for the expeditious execution of orders for such products or materials. This means that the Armed Services can demand a priority for steel they need to manufacture equipment.

It is estimated that the armed services will take about 5 per cent of total steel production per year under this provision. The House Committee on Small Business, which pre-



pared the provision, makes this estimate. There is no limit on the amount of steel that may be obtained by priority under this authority, but there is a condition that directs the President to report to Congress when more than 10 per cent of total production is so acquired.

The White House has since announced that Armed Services procurement this year will not amount to more than 2 per cent of U. S. output, and that an attempt will be made to obtain it, not under the draft act, but under the voluntary agreements program administered by the Department of Commerce.

Subsequently, the Department of Defense sent over to the Department of Commerce an estimate of 1.4 million tons of steel products for the fiscal year. This was described as a tentative estimate. It is a safe guess that it will be larger.

With a "club in the closet," in the form of the steel priority provision in the draft act, it is certain the steel industry will not quibble over the Armed Services request for a voluntary allocation.

The Economic Cooperation Administration also has a request on file with the Department of Commerce (Office of Industry Cooperation) for a voluntary allocation of steel for the European Recovery Program. These two requests, which have authority of other legislation behind them, will undoubtedly be approved. It is a safe estimate that steel availability for domestic consumption will be curtailed by approximately 5 million tons as a result of these programs. As soon as the draft law begins to create a new Army, procurement estimates for steel will go up.

Another provision in the draft act (also in previous draft legislation) authorizes the President, whenever it is in the interest of national security for the Government to obtain prompt delivery of materials for the Armed Forces, to place an order with an industrial plant for any quantity of material deemed necessary and require prompt delivery at a negotiated price. If this order is not delivered, the President may

direct seizure of the plant.

This provision applies to *any material* which may be deemed necessary for the Armed Forces. It was introduced by Representative Lyndon Johnson, a Democrat, of Texas, and approved by the Armed Services Committee.

The Department of Commerce is now studying this provision for its possible use as another "club" to work out a voluntary agreement to get copper, lead, zinc, and tin for the national stockpile. This will

probably place greater stress on users of these metals.

The Office of Industry Cooperation recently announced the Steel Industry Advisory Committee had approved a program for the voluntary allocation of 58,000 tons of steel for the construction of prefabricated steel houses. It is estimated that the Lustron Corporation, which is producing an enameled house, will get about 48,000 tons of this allocation.



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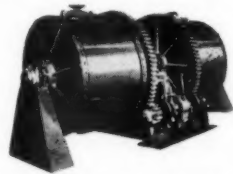
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# NEWS

V. A. Burdett, Porcelain Enamel Institute, announces the addition of Charles H. Gohrt to the organization. Mr. Gohrt (left) is a technical

## Record attendance anticipated at PEI annual forum

Early indications of interest from as far away as South America promise a record attendance to the 10th Annual Forum of the Porcelain Enamel Institute to be held at the University of Illinois, Urbana, October 13-15, according to a PEI report.

Particular interest has been shown this year in the Forum program, which features a panel discussion of titanium enamel developments, applications and properties, and the application of cover coats direct to steel. Other papers will discuss quality control through incentives, liquid and airborne waste control, coat budgeting, safety and health, an industry-wide survey of drying practices, high temperature ceramics for aircraft power plants, and many other equally vital subjects, it was stated.

## H. H. (Steve) Sweeney dies

Henry H. (Steve) Sweeney, vice chairman of the Northern Ohio Section of the American Ceramic Society and sales engineer for North American Refractories Co., died July 2, in Cleveland, Ohio.

## Tennessee Enamel employs industrial designer

F. Donald Hart, vice president of Tennessee Enamel Mfg. Co., Nashville, reports that Howard Bourner has joined the company as design engineer. Bourner was formerly an independent industrial designer, with

offices in St. Louis. His design work has covered a wide range of products, including space heaters, furniture and industrial equipment.

## Rohm & Haas appoints industrial relations mgr.



Robert C. Landon has been appointed manager of industrial relations of Rohm & Haas Company and The Resinous Products & Chemical Company, Philadelphia chemicals manufacturers.

Landon was previously connected with Babcock and Wilcox Co. and Carnegie-Illinois Steel Corp. During 1944 he was employed by the government to reorganize the personnel functions of the AAF materiel command at Wright Field, Dayton, Ohio. He is a native of Chicago, and a graduate of Yale.

The Harrington & King Perforating Co. has announced the retirement of J. M. Fuller as president after 62 years of service with the firm. He was succeeded by Foye P. Hutchinson.

## U.S. Steel to release movie on company progress

United States Steel's new motion picture, "Unfinished Business," will soon be released throughout the country, according to an announcement. The film had its premiere May 3 at the corporation's annual meeting of stockholders. It describes from V-J Day the progress of the firm.

## Dr. Huppert to open jobbing plant in Manchester, N. Y.

Word comes to *finish* that Dr. Paul A. Huppert, currently enamel plant superintendent at Lisk-Savory Corp. and formerly associated with large enameling facilities in Czechoslovakia and other European countries, will open a new porcelain enamel jobbing plant in Manchester, N. Y., this fall. The company's name will be Manchester Porcelain Enamel Corp.

Readers of *finish* will remember Dr. Huppert from his articles—"A Modern Holloware Enameling Plant," "Europe's Prewar Enameling Industry," "Lithium Compounds in Porcelain Enamel Compositions," "Porcelain Enameling in Italy"—which have appeared in this publication.

As World War II made the operation of European enameling plants, with which Dr. Huppert was connected, a virtual impossibility, he came to this country in 1943 and since that time has taken out citizenship papers. He tells us that he officially became a United States citizen on June 28.

## Sayre to Notre Dame advisory council

Judson S. Sayre, president of Bendix Home Appliances, Inc., has been elected vice chairman of the



advisory council for the college of commerce at the University of Notre

Dame. The council is composed of 28 leading businessmen.

### Ten thousand expected at AGA convention

More than 10,000 persons are expected to attend the 30th annual convention of the American Gas Association and the exhibition of Gas Appliance Manufacturers Association to be held in Atlantic City, N. J., October 4-8, according to Association reports.

Factors influencing this anticipated record attendance are a strong business program, the largest and most spectacular exhibition of new and improved gas appliances and equipment, and greater participation of dealers and wholesalers from all parts of the country.

A major part of the program for October 7 and 8 will be directed toward dealers and a concerted effort is being made to extend the benefits of the appliance and equipment exhibition to a large segment of the gas appliance field. This is the first time the exhibition has been open to wholesalers and dealers, and more than 25,000 of them are receiving special invitations to attend. A merchandising program for dealers is being arranged jointly by AGA and GAMA for October 7.

Liquefied petroleum dealers are also being invited to the exhibition, and will hold a meeting October 8, at which time GAMA will sponsor a merchandising clinic program.

Many vital industry-wide problems will be discussed at the general sessions by authoritative speakers from within and outside the gas industry. Among the topics on the tentative program are such subjects as regulation, labor relations, salesmanship, promotion, advertising and research activities, and an analysis of the commercial gas load.

A luncheon featuring a topflight utility speaker discussing the value of the industrial gas load to the gas industry will open the Industrial and Commercial Gas Section program Tuesday afternoon, October 5, at the Ritz-Carlton Hotel. This will be followed by a full afternoon session at which the major activities of the

Section will be reviewed. The AGA commercial gas cooking promotional program will hold a prominent spot on the program and will include a showing of the new film "Where Food Is Finest." Other prospective subjects are publicizing industrial and commercial gas, and industrial gas sales and research.

Colorful dramatic presentations will highlight the Residential Gas Section program Wednesday after-

### Norge personnel changes



J. N. Candler

Howard E. Blood, president of Norge division of Borg-Warner Corp., has announced several changes in the company's sales and manufacturing departments.

J. N. Candler was made director of manufacturing; H. L. Clary was named director of sales, and W. S. Law was named general sales manager.

At the same time, Blood announced the resignation of R. W. Gifford, vice president and ass't general manager, and I. H. Reindel, executive engineer, and the retirement of M. G. O'Harra, vice president and director of sales. Gifford will remain chairman of Borg-Warner International Corp.

Candler will have full charge of manufacturing, engineering and qual-

ity in all Norge plants, it was stated. He has been with Norge and Detroit Gear divisions of Borg-Warner in various engineering and manufacturing capacities since 1940.

### Alfred U. graduate to Ing-Rich

Lewis Palter, recently graduated from the Ceramic School of Alfred University, has accepted the position of ceramic engineer with Ingram-Richardson Mfg. Co. of Indiana, Inc., Frankfort, Indiana, according to John M. Hurd, advertising manager.

### Washer sales 30 per cent ahead of 1947

Sales of standard-size household washers for 1948 passed the grand total for 1946 in June, and are 30 per cent ahead of the comparison months in 1947, according to industry-wide figures reported by the American Washer and Ironer Manufacturers' Association.

Sales in the January-May period aggregated 1,873,090 units, compared to 2,023,981 in all 1946, and 1,439,934 in the first five months of 1947, said the report.

### Harbison-Walker names new plant superintendents

Harbison-Walker Refractories Co. has announced the appointment of Thomas W. Lloyd as district superintendent of the company works at Baltimore, Md., and Chester, Pa. A. M. Tvergaard has been named



superintendent of the new Baltimore plant which is scheduled for completion in early fall.

The company says that the Baltimore plant will be the most modern basic refractories plant on the eastern seaboard. It has been under construction since 1946.

#### Allen to Clyde Porcelain Steel

George Allen has been appointed head of the planning and scheduling department at Clyde Porcelain Steel Corp., Clyde, Ohio, according to Wade Willey, vice president and general manager, who stated that Allen would be in charge of all pro-

duction and delivery schedules in the company's two plants.

Previously, Allen spent 18 years in the production and material control department at Kelvinator division of Nash-Kelvinator Corp. He also spent 17 years with Ford Motor Co.

#### National Ceramic Exhibition set for Nov. 7 to Dec. 12

The 13th National Ceramic Exhibition at the Syracuse Museum of Fine Arts will be held in Syracuse, N. Y., from November 7 to December 12, it has been announced.

#### Wyandotte Chemicals has 298 father-son teams



The employee magazine of Wyandotte Chemicals Corporation is currently featuring photographs of some of the 298 father-son, father-daughter, and father-son-daughter combinations in the company's employ. One of these teams is pictured here—the four William Sharlows, three of whom have already served the Wyandotte organization for a total of 62 years, and who represent three generations.

E. M. Ford, president of the firm, is the fifth of his family to head their enterprises. His great-grand-

father, Capt. J. B. Ford, founded Michigan Alkali in 1890 and the J. B. Ford Co. in 1898.

#### Increased use of color predicted

Pemco Corporation has increased the production capacity for porcelain enamel colors, glass colors, and glaze stains and colors, according to an announcement by Jake Eagle, manager of color sales.

"The significance of this expansion within our company," said Eagle, "tends to acknowledge the

fact that the increased use of color on household porcelain enamel ware and other ceramic and glass ware is indeed the coming trend, and in our estimation it will not be long before the housewives of America will demand that household appliances heretofore produced, for the most part in white, be made available in color."

#### Titanium pigment prices up

Higher costs of production and shipping have necessitated an increase of one-half cent a pound in the price of titanium dioxide pigments and one-fourth of a cent a pound for titanium calcium pigment, the Du Pont Company has announced.

The basic price of the anatase grades of these pigments will be 18 cents per pound, the price they were selling for in 1931. Rutile grades of titanium dioxide were not produced at that time, it was stated.

#### Steel prices up

United States Steel Corporation announced, on July 20, new prices of steel at mills or shipping points.

Benjamin F. Fairless, president, stated that the "New prices embrace a restoration of the average price reduction of about \$1.25 a ton made by these (U.S. Steel) subsidiaries last April, and in addition include an average increase of approximately \$3.09 a ton or about 9.6% in the base prices for major steel products then quoted by these subsidiaries".

It was stated that the following new prices, applying on car-load lots and figured at cents per pound; were effective for Carnegie-Illinois shipments on or after July 21: hot rolled sheets, 18 ga. and heavier, 3.25; cold rolled sheets, commercial quality, 4.00; Vitrenamel sheets, 4.40; and holloware enameling black plate, 4.75.

#### Gain in plumbing fixtures

Shipments of plumbing fixtures during the first quarter of 1948 were

40 per cent greater than for the same period in 1947, according to summaries released by the Bureau of Census of the Department of Commerce.

#### Youngstown official dies

Lawrence H. Underwood, assistant to the vice president in charge of operations for The Youngstown Sheet and Tube Company, died June 26 at the age of 67.

#### Apex adds to appliance line

Apex Electrical Mfg. Co. recently added the Dish-A-Matic washer to its regular lines of cleaners, washers

and ironers by acquiring the capital stock of the manufacturer, Lake State Products Co., of Jackson, Mich., according to a report.

#### Store fronts considered show pieces

the 2nd Store Modernization Show held in New York City, July 6-10.

According to Versen, "The far-sighted designs of top-flight store architects and designers with a keen alertness to the prime functions of a store interior have shown to all shrewd merchandisers that their store must be a 'show', devoid of unnecessary embellishments — an effective stage for the sale of merchandise."

Bernard F. Greene, Fluorescent Lighting Association, also discussing the problem of store front and interior design before another panel, said that "a factor which is of great importance is color: color as an attractive decorative element; and color for inspection of merchandise. The color of the light source is the primary element in determining the color of the different wall surfaces and of the merchandise."

In the Store Modernization Show's national competition to determine the best local store modernization completed from January 1 to June 1, the entry of Trenton, N. J., Chamber of Commerce, a newly modernized Ladies Specialty Shop designed by Victor Bohm, A.I.A., received the first prize of \$250, it was announced by John W. H. Evans, managing director of the Show.

Runner-up honors, which included a \$125 prize, were awarded to the entry of the Fullerton, Calif., Chamber of Commerce, the Pillowry Gift Shop; the third award was given to the Sioux City, Iowa, Chamber of Commerce's entry of the Toller Drug Company store.

First prize of \$500 in the college competition for the modernization of a business block was won by Syracuse University's team which submitted a solution for a shopping center for Poughkeepsie, N. Y. Second honors were awarded the Cooper Union team for their proposed solution for New Rochelle, N. Y. Third honors were accorded to the Univer-

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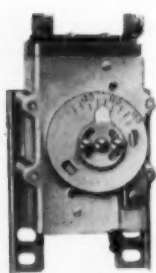
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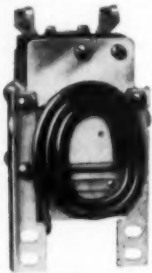
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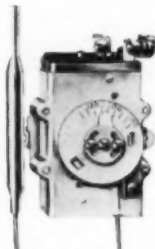


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Model F-1 Immersion Type—Single pole, double throw model used to switch current from high to low where two heating elements are used.



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BRIDGEPORT THERMOSTAT DIVISION, BRIDGEPORT, CONNECTICUT  
AMERICAN THERMOMETER DIVISION, ST. LOUIS, MISSOURI

53



### Fred Doering dies in auto crash

Many friends of Fred Doering throughout the porcelain enameling industry will be shocked to hear of his untimely death as a result of an auto accident.

Fred was well known to enamellers throughout the midwest, where for many years he was associated with Cribben & Sexton Co. as superintendent of the enameling plant and later as works manager. In 1947 he moved to California (*see October, 1947 finish*) to accept a position as superintendent with James Graham Mfg. Co., where he was associated at the time of his death.

### Texlite sign plant nearing completion

The new \$700,000 sign plant of Texlite, Inc., Dallas, Texas, is nearing completion, according to H. H. Wineburgh, president.

The plant, which will contain 114,000 square feet of office and factory space, is expected to be in full operation by next February 15,

said Wineburgh. He added that a considerable amount of new equipment for easier handling of materials,

a new laboratory, and a complete new pickling department is being installed.

### Research committee directs attention to heat flow studies at Columbia U.

In its annual report submitted at the 1948 Chicago convention of the American Ceramic Society, the Glass Division Research Committee endorsed the work on heat flow being carried out by Dr. V. Paschkis and his staff at Columbia University, and recommended that the industry give consideration to the support of further work.

While many technical difficulties must still be overcome before the electrical analogy method can be generally applied to three-dimensional studies, it has already been found useful in the solution of problems of transient heat flow such as arise in glass-molding operations. Further development of the method can be attained most efficiently by its actual application to industrial problems of

progressively greater complexity.

### Merchandise Mart tours resumed after summer market

The guided tours of The Merchandise Mart, discontinued during the summer homefurnishings market, have been resumed, according to Wallace O. Ollman, general manager. The tours were attended by more than 22,000 consumers since the program was instituted in April, it was stated.

### Harrington & King appoints sales manager

The appointment of David K. Colesberry as general sales manager of Harrington & King Perforating Co. was announced by Foye P. Hutchinson, president of the 65-

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### Observation at homefurnishings show



Frank Forsberg, publisher of Liberty Magazine, inspects automatic soap injector of Bendix washer during homefurnishings show. It is being demonstrated by Robert Moore, left, of Bendix Home Appliances, Inc., while Ashley Chambers, Birmingham Electric Company, observes.



year-old firm which specializes in process application and ornamental uses for perforated materials.

Colesberry was previously connected with Sharples Corp., centrifugal and process engineers, for 22 years.

## Summer home-furnishings market

(Continued from Page 45)

sponsible for establishment of the college course for the purpose of elevating furniture manufacturing to the dignity of a profession—in order that they might obtain first hand information on the manner in which home-furnishings markets are conducted. Eighteen of the students were from the University of Michigan; the other two were from the University of Minnesota.

### New styles and products

There were many new styles and products featured at the summer show. One of the most talked about new appliances was the Hotpoint electric range with individually lighted pushbutton controls which identify heat settings on the surface units and the oven. The new range was reported as being produced in both single and double oven models.

Another "attention getting" product was Kaiser Fleetwing's combination dish washer, sink, and disposal unit which was just being put into production.

### Showmanship in sales

A new idea in appliance promotion was featured by Westinghouse. On a special stage, Roy Douglas, ventriloquist, and his stooge, Eddie Westin, presented "Kitchen Capers" at regular intervals during the market. The act has been scheduled by Westinghouse for the West Coast homefurnishings market, after which it will be booked with department stores.

Demonstrations of their latest refrigerators and ranges were presented by Norge on separate miniature stages. With the pressing of a button, a curtain would part, showing the product. A voice recording, with a musical background, would then list the product features while

doors would open, lights flash on, and parts move automatically. A limited number of these automatic stage units are being built by Norge for promotional purposes.

Buyers visiting Mullins Mfg.'s new permanent display at The Merchandise Mart found a choice of six Youngstown Kitchens, each one fully equipped with a different arrangement of kitchen appliances.

*The reporter visiting the display*

rooms at both marts found many manufacturers featuring porcelain enamel on automatic clothes washers, dryers, ironers, dish washers, ranges, heaters, table tops, refrigerators, and kitchen ware. Despite the critical steel situation, it was apparent that many appliance producers were determined to continue using porcelain enamel for surfaces subject to extremes in temperature and harsh abrasive use.

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**Specification Materials**  
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## Waterlining as related to dry beading

(Continued from Page 27)

different salts in different enamels. Since the salts crystallize only from concentrated solutions, such solutions were used for beading in an effort to determine which ones might be responsible for the waterlining phenomenon. Zircon, acid-resisting titanium, and acid-resisting antimony enamels were selected for this test and concentrated, and fifty per cent concentrated salt solutions were used for beading. (See Tables 3 and 4.)

Figures 5, 6 and 7 show the test pieces beaded with saturated solutions. Figures 8, 9, 10, 11, 12, and 13 show test pieces beaded with fifty per cent solutions.

None of the soluble materials exactly duplicated the appearance of the line of discoloration, but several of the salts reacted in a similar manner. When the saturated solutions were used, the salts having a reaction with the cover coat enamels most nearly approaching the line of discoloration were: (1) sodium carbonate, (2) sodium silicate, (3) sodium nitrite, and (4) potassium carbonate. When the fifty per cent saturated solutions were used, the salts having a reaction with the cover coat enamel most nearly approaching the appearance of the line of discoloration were: (1) sodium carbonate, (2) potassium carbonate, (3) sodium nitrite, and (4) potassium silicate. Barium chloride was the only salt that had an appreciable beneficial effect on the severity of the line of discoloration, although several of the salts did react with cover coat enamels to give a more opaque appearance.

### X-ray, spectrographic, petrographic, and polished section studies

These studies were an attempt to find a difference, either chemical or textural, between the region of the line of discoloration and the rest of the cover coat.

X-ray powder diffraction patterns, of samples taken from the line of discoloration and from the rest of the cover coat, of both titanium and zircon enamels (both dried and fired

for one minute) showed no differences and were therefore not conclusive. The mother liquid with the solids of the slip filtered out was dried and the residue tested for identity by means of x-ray. The residue appeared amorphous but showed a weak x-ray pattern corresponding to sodium meta silicate.

In the preparation of thin sections of the unfired line of discoloration, the glass microscope slide was dipped in the cover coat and allowed to dry; a drop of distilled water was then placed on the bisque cover coat. It was noted that the line of discoloration was visible from the side opposite the enamel layer which proves that the line of discoloration is not a surface phenomena, but that it extends the depth of the cover coat.

When the top portion of the cover enamel was removed by rubbing lightly with the forefinger, the line of discoloration was left as a ridge, indicating that it has greater hardness than the rest of the cover coat. When the enamel layer was impregnated with balsam, the line of discoloration became more pronounced, indicating a large difference in the index of refraction between the balsam and the material in the line of discoloration. After the thin section was completely ground and heated for the application of the cover glass, the line of discoloration blended with the rest of the slide and was barely discernible. This indicates that the material comprising the line of discoloration is of a porous nature. The sharp contrast, noticed when the balsam was first applied, disappeared after the section was ground and the balsam reheated. The thinner enamel layer allowed the balsam to penetrate the pores and expel the entrapped air, which caused the sharp contrast when the balsam was first applied. The region of the line of discoloration appeared isotropic and the same as the rest of the cover coat under the petrographic microscope. Figures 14 and 15 are photomicrographs of polished sections through the line of discoloration. These pho-

tomicrographs show the nature of the discoloration; that is, they show the large bubbles. This is the same type of discoloration as found for all enamels.

### Use of a fining agent

All of the results and tests indicated that the actual phenomenon causing the line of discoloration was the development of excessive bubble formation in this region. In the use of gas opacified enamels it is necessary to use certain salts such as ammonium chloride and sodium chloride to fine out the oversized bubbles during firing. Ammonium chloride was therefore added in an amount of 0.2 per cent to the mill batch of the cover enamels in an attempt to accomplish the same result in the region of waterlining.

In some cases this showed a remarkable improvement and aided in all cases tried. It interferes, however, with the set of the enamel. Further investigation may show that some other similar material can be used without interfering with set or that the set using ammonium chloride can be controlled.

### Summary and conclusions

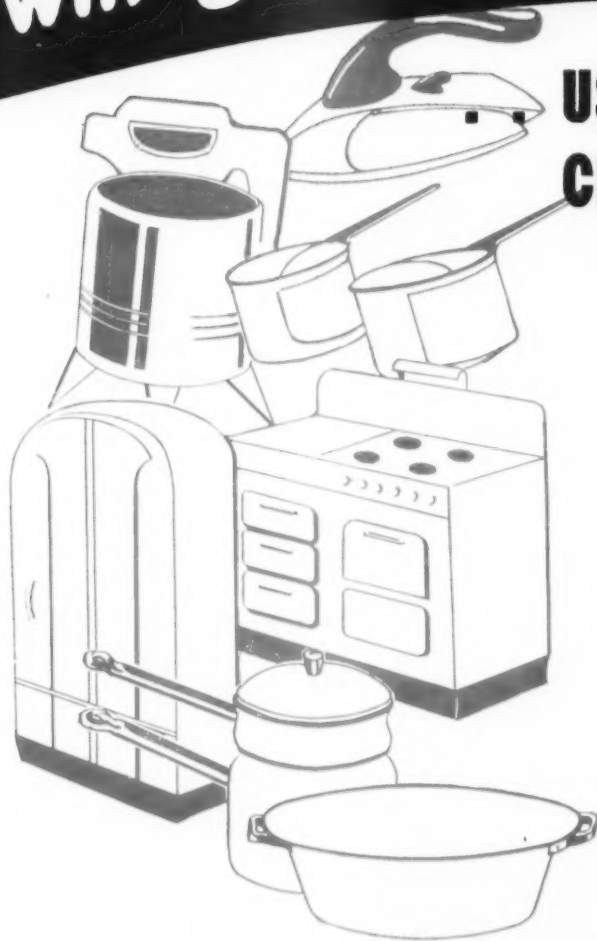
Observations of the results of this study offer the following:

1. The line of discoloration is always present, and the severity determines whether or not it is a serious defect.
2. The line of discoloration is caused by the concentration of soluble salts by the beading water in the region of the farthest penetration of the beading water; these soluble salts may be either electrolytes or salts leached from the frit.
3. The soluble salts have a strong fluxing action on the cover enamel, causing it to fire at a lower temperature (or in a shorter time interval) than the rest of the cover coat.
4. The line of discoloration, when caused by the soluble salts leached from the frit, consists of large bubbles. These large bubbles are the result of decomposition of the soluble salts and the evolution of gas, while the enamel is in a molten state. This is substantiated by the action of am-

to Page 62 →



# WHY 5000 CUSTOMERS...



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Take a poll of OHCO users, and you'll find a score of different reasons for their choice of this house as their source of raw materials.

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## The growing acceptance of architectural porcelain enamel

(Continued from Page 31)

ly trained personnel to carry on future sales.

### Competitive conditions

New products usually require large promotional programs before being placed on the market. This, however, was not the approach of architectural porcelain enamel. The product was brought into use on small jobs chiefly by emphasizing its low price, plus the ability to secure color and permanence. This low price concept has been with us ever since and can be charged with the general public's conception of porcelain enamel as an alternate product rather than a major quality material.

Price wars were encountered between companies, each of which was trying to secure additional business, and this condition kept the price low to the beginning of the war.

The concept of porcelain enamel as an alternate building material was exemplified in the aggressiveness used to replace glass with porcelain enamel. The architectural glass field seemed to offer the best outlet for porcelain enamel and as a result glass dealers were solicited far and wide

to sell the new product rather than glass on all their jobs. This unusual control of distribution retarded the industry's growth in many ways. It permitted competition to drive down price. Use as a replacement for glass, moreover, did not present the good features of porcelain enamel, knowledge of which is necessary for a steady approach to its goal as a quality product. In many cases, this approach even froze its sale and presentation to the public.

### Unprecedented demand

#### for porcelain enamel

The end of the war provided an unprecedented demand for porcelain enamel. The condition was accentuated by two factors: (1) the shortage of available steel, and (2) a productive capacity of porcelain enamel smaller than pre-war.

Added to the above, the abnormally high price of glass, terra cotta, brick, and prolonged deliveries of these materials accounted for the ease with which porcelain enamel could be sold.

Active quality competition between porcelain enamel companies is be-

ginning to characterize many jobs and, with an increase in supply, other building material prices are lowering, thereby creating a healthier and more favorable industry atmosphere characterized by a buyer's market.

The foregoing summary denotes a young industry, possessed with tremendous potentialities, and the recipient of a large volume of present day business.

### Potential market lends itself to sale of porcelain enamel

There does not seem much doubt as to the large potential market that lends itself to the sale of porcelain enamel. Its steadily expanding physical use and acceptance, its notable increase of quality, its adaptability to complex design, the development of new textures and finishes — all tend to justify this assumption. Other favorable factors are the manifestation of more cooperation among building officials in municipalities and government agencies, the strengthened cooperation of the Porcelain Enamel Institute in promoting a strong and unified industry, and the intelligent and comprehensive realization by leading manufacturers of the true value of their product in all phases of the architectural field.

Even such a promising picture is fraught with dangers, dangers that must be met if a healthy and prosperous growth is to be continued.

Barring unforeseen occurrences, the immediate future, we feel, will bring an end to the seller's market and a return to normal conditions — a condition requiring intelligent and active merchandising.

With extended research exploring the unknown for improvements, and dismissing the doubters who would negate true progress, we should see expanded public and trade advertising of porcelain enamel. There should be established sales organizations composed of well trained, educated, high caliber men capable of meeting the problems of competition, and having sufficient stature to command the respect of all. Installations of the material must be carried on with skillfully trained personnel, justifying the public acceptance.

*One of the latest uses for architectural porcelain enamel is in the home. This interior photo of the Lustron House shows the porcelain enamel walls.*





## New Supplies and Equipment

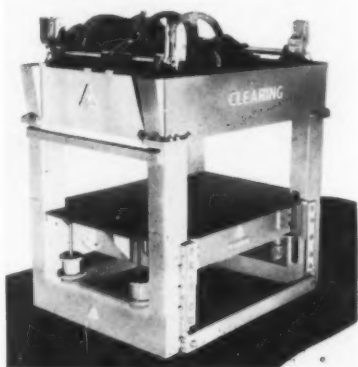
### Speed nut for bench assembly of range oven doors

A new type speed nut which permits complete bench assembly of cooking range oven doors has been developed. It is said to speed up range assembly by permitting a complete door to be carried to the range and quickly attached, with two nuts used on each door.

In assembly, the speed nuts, which house the hinge pins, are first fastened loosely to the door liner with the hinge pins passing through holes in welded support brackets. The slotted holes in the liner permit the hinge pins to be drawn inward to give clearance for positioning door in range.

Contact Tinnerman Products, Inc., 2038 Fulton Road, Cleveland 13, Ohio.

### Welding press for large complicated sections



A spot welding press, capable of handling large complicated sections, is said to perform the welding job in one step. Moreover, it is stated that several welds can be done at the same time.

Contact Clearing Machine Corp., 6499 West 65th St., Chicago, Ill.

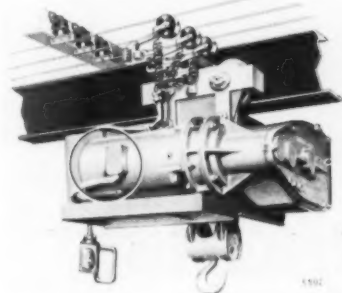
### Automatic water remover for air compressor tanks

A fully automatic water unloader which removed water and oil from air compressor tanks has been an-

nounced by a manufacturer of spray gun equipment.

Further information on the "Lansdale" water unloader is available from A. Shelburne Co., 739 Ceres Avenue, Los Angeles 21, Calif.

### Self-equalizing brakes for electric hoists



A new type automatic self-equalizing motor brake for electric hoists has been developed. Magnetically released, the brake consists of a series of self-aligning circular friction discs, alternated with brake plates attached to the motor shaft. When power is switched off, or should power fail, this brake holds the load securely, it is stated.

Contact Hoist & Crane Division, Robbins & Myers, Inc., Springfield 99, Ohio.

### Laboratory kiln with built-in instruments

A new complete laboratory kiln has all controls and operating mechanism contained in one single compact housing. The makers claim that the kiln has an "extremely flexible firing cycle and heating range."

Contact Pereny Equipment Co., 393 Chambers Road, Columbus 8, Ohio.

### Metal cleaners announced

One of two new metal cleaners, Calgon No. 21, is described as a dry granular alkaline detergent for spray cleaning in metal washing machines. In addition, it is said to be effective when used in combination with the

new Calgon emulsion cleaner for immersion cleaning in dip tanks and for heavy-duty spray cleaning.

Contact G. S. Chappars, Ketchum, MacLeod & Grove, Inc., 411 Seventh Ave., Pittsburgh 19, Pa.

### Compressed air purifier

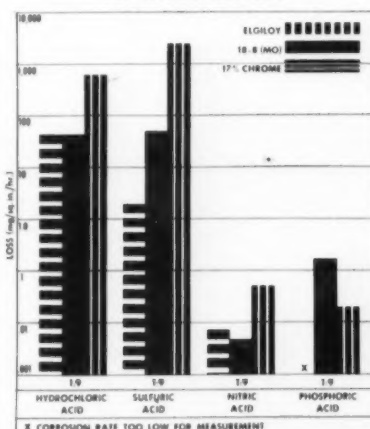
Elimination of moisture, dusts, grits, and rust particles from compressed air is the purpose of a "compressed-air purifier" manufactured by E. D. Bullard Co., 275 Eighth St., San Francisco, Calif.

### Small die casting machine

A new small type die casting machine, model M55A/HF, is air-operated, and designed for quick casting of small parts in zinc alloy, utilizing low cost single-cavity dies operating at high speed. It can easily maintain a production rate of 20,000 shots per week, according to the manufacturer's description.

Contact the DCMT Sales Corp., 315 Broadway, New York 7, N.Y.

### New alloy available for industrial use



Corrosion comparison is illustrated with this logarithmic scale chart.

Widespread use in various industries of a new alloy developed by Elgin National Watch Co., for its mainsprings is indicated from recent experiments with the metal.

The alloy, known as "elgiloy", was developed under the direction of the company's research department

and Battelle Memorial Institute. It was offered to any and all industries which might be able to utilize its "unusual qualities" by T. Albert Potter, chairman of the board of the Elgin, Ill., firm.

#### Flue gas analyzer

A flue gas analyzer for continuously indicating and recording stack gases, as a guide for more efficient combustion, has been developed by

Instrument Division, Davis Emergency Equipment Co., 45 Halleck St., Newark 4, N. J.

#### Electric buffing machine

A new automatic electrically powered buffing and polishing machine, capable of finishing 800 parts an hour, is claimed by its makers to have solved the problem of high labor cost in finishing small objects with diameters up to three inches or up

to seven inches if only four spindles are used.

For information on the "V-8 Vanott" buffing machine, write Vanott Machine Corp., 236 Colgate Ave., Buffalo 20, N.Y.

### Industrial literature

#### Guide to accident prevention

A new catalog tells where to use, how to use, how to maintain, and how to select industrial protective equipment. The 64-page book is designed as a guide to accident prevention.

Write Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12, Ill.

#### Brochure on design and sales

A brochure of dignified design, entitled "Design Increases Sales," illustrates the immense strides taken in product, package and machine designing, engineering and building in the past few years. It is available from Barnes & Reinecke, Inc., 230 East Ohio St., Chicago, Ill.

#### Bulletin on punching machines

A new bulletin describes a line of gang punching machines particularly designed for increasing production of items requiring multiple punching of holes in steel sheets and plates. The bulletin describes mechanical features and presents specifications for 12 machines.

For bulletin No. GPM-48, write Verson Allsteel Press Company, 9320 So. Kenwood Ave., Chicago 19, Ill.

#### Manual on selection of industrial ovens

A new "planning guide for production people" has been published under the title "How to Select the Right Oven for Your Process."

The manual discusses: basically different types of oven heating systems, when to use which, different heating media, temperature and safety control, insulation, material handling, and the action of different prod-

Opacity sells porcelain products

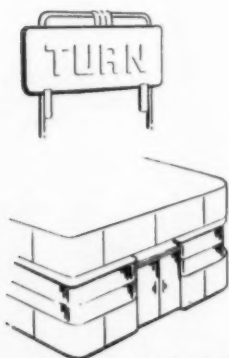


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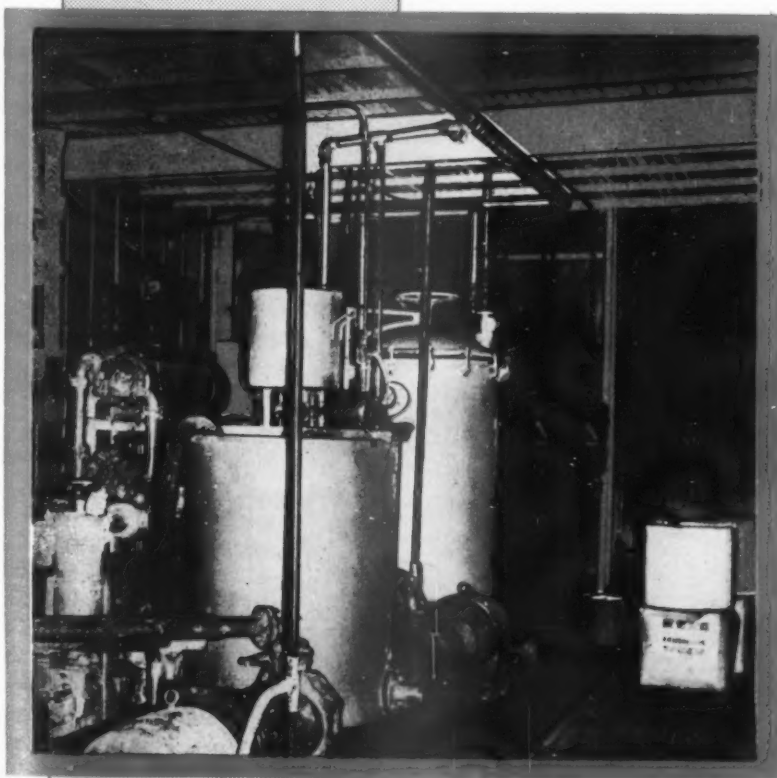


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OREFRACTION RUTILE—now available for ceramic colorants

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To obtain quality porcelain enameling on a production basis requires pickling room solutions that are clean. The presence of impurities in solutions means an increase in the amount of rejects. Proper filtration is the economical way to increase your production and keep it on a quality basis. Porcelain enameling plants that operate on a large scale day in and day out, know the value of keeping their solutions free of impurities. That is why Industrial Filters are the first choice of enamellers who are quality minded.



At left — Typical installation of Industrial Filter system for enameling plants.

This arrangement consists of filter, pumping unit, primer-strainer unit, mixing tank, control valves, fittings and piping.

These features facilitate the convenient use of filter aids and purifying agents, making it an ideal continuous filtration system, and equally as effective for intermittent filtering. Systems are provided for all solution requirements.

For 20 years "Industrial" has been building filters that have enjoyed an outstanding reputation for dependability, low upkeep cost, long life and bed rock operating economy. That is why so many enamellers say "I prefer the Industrial way."

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ucts under heat (chemically, physically, metallurgically, structurally).

For copies, address H. Gehrich, Gehrich & Gehrich, Inc., 3232 57th Street, Woodside, L. I., N. Y.

#### **Booklet on polyvinyl alcohol**

The polyvinyl alcohols, solid alcohols in powder form, are a series of resins useful in a variety of industrial applications. The physical and chemical properties, commercial grades, uses and applications of these resins are described in a new booklet, "Elvanol Polyvinyl Alcohols." Stencil screens for decorating ceramics represent one of the uses described.

Write The Du Pont Company, PR Department, Wilmington 98, Delaware.

#### **Bathroom planning booklet**

Many hints on the planning of bathrooms and powder rooms are offered in a new booklet published by Plumbing and Heating Industries Bureau, 35 East Wacker Drive, Chicago 1, Ill. The price is 10¢ per booklet.

#### **Data sheet on non-electric pulley type separators**

A data sheet incorporating special features, typical applications, and a table of dimensions and capacities covering the new "Alnico Perma-Pulley" magnetic separator has been issued. These non-electric pulley type separators are designed for automatically separating dry materials.

Contact Dings Magnetic Separator Co., 4740 W. McGeogh Ave., Milwaukee 14, Wis.

#### **Abridged edition of manual on porcelain enameling**

A new pocket-size abridged edition of "A Manual of Porcelain Enameling" has been issued. The new publication is a condensation of an original 513-page book edited by J. E. Hansen, Ferro Enamel Corporation, and published in 1937.

Copies are available, at one dollar each, from Enamelist Publishing Co.,

4150 East 56th Street, Cleveland 5, Ohio.

#### **Industrial chemicals catalog**

A new 32-page catalog on industrial chemicals contains an alphabetical listing of available chemicals.

Copies of the booklet and additional information on items not listed may be obtained from The Harshaw Chemical Company, 1945 East 97th Street, Cleveland, Ohio.

#### **Booklet on pickling and bright-dipping metals**

Complete technical data and a description of a pickling compound, used as a substitute for sulphuric acid, is contained in a booklet entitled "Troxide for Pickling and Bright-Dipping Metals".

### **Production of commercial and reachin refrigerators**

(Continued from Page 42)

*finish*) is comparable to our findings. Fairly satisfactory results have been obtained with the use of only one cleaner and acid tank. Cleaning must be very thorough as a minute oil film, not necessarily detrimental to ground coat processed ware, will not allow a proper wetting of the cover coat during firing and will affect adherence. Nickel deposition should be kept within a range of .06 to .08 grams per square foot. A cyanide, sodium hydroxide, borax neutralizer is being used.

Straight line production would

Copies are available from Waverly Petroleum Products Company, 468 Drexel Bldg., Philadelphia 6.

#### **Booklet on new products**

More than a thousand new products and services, gathered in a nationwide survey, have been compiled in an 80-page "New Products" booklet.

Copies are available at 50¢ each from N.Y. Journal of Commerce, 63 Park Row, New York, N. Y.

#### **Catalog on enamel plant supplies and equipment**

A catalog of "Porcelain Enameling Supplies" includes lists of supplies and equipment needed in enamel plant operation.

For copies, write The O. Hommel Co., Box 475, Pittsburgh 30, Penn.

probably warrant improving facilities to cope with the careful control necessary and as outlined in the previous article, in order to give the best results in developing a one cover coat system for the enameling industry.

This is one case where the properties of titanium bearing killed steel have been used in actual production to help solve a production problem, and extend the developments in the industry, in producing a quality cover coat finish applied directly to the base metal as a one or two fire finish.

### **Waterlining as related to dry beading**

(Continued from Page 56)

monium chloride, when 0.2 per cent ammonium chloride is used as an electrolyte. The ammonium chloride promotes the escape of the gases during firing, and therefore, the line of discoloration is barely discernible.

5. The line of discoloration may be minimized by the addition of an electrolyte that promotes the escape of gases evolved during firing, or by the addition of an electrolyte, such as magnesium sulfate, which gives added opacity to counteract the loss in opacity due to the large bubbles.

6. The soluble salts, leached from

the frit, that cause the line of discoloration, are probably alkali silicate gels as the x-ray patterns of the samples taken from the region of the line of discoloration do not have strong lines, as they would for crystalline material.

7. The tearing at the bead is caused by the disruption of the cover coat film by the beading water.

1. R. J. Whitesell, "Factors Influencing Dry-Beading Defects," *Journ. Amer. Ceram. Soc.*, Vol. 24 (7), pp. 241-243 (1941).
2. "A Manual of Porcelain Enameling," The Enamelist Publishing Company, Cleveland, Ohio, 1937, pp. 233-234.



## **Frigidaire's Canadian porcelain enameling plant**

*(Continued from Page 22)*

baskets suspended from a carrier arm of the machine. The machine has given very satisfactory service during its first year of operation, and maintenance costs have been low. Quality of pickling has been excellent and it is felt that the results fully justify the large initial expenditure for a continuous automatic pickling machine in a relatively small porcelain plant.

### **Application of ground coat**

General practice is to dip all parts in ground coat, but parts which cannot be satisfactorily drained are sprayed. The dip tanks are wheeled from the mill room and placed directly under the ground coat conveyor line. As the parts are unloaded from the pickle machine, an operator inspects them and then hangs the part on the conveyor line which comes close to the unloading station of the pickle machine. The dipper removes the part from the hanger, immerses it in the dip tank, and then immediately hangs it back on the conveyor line. All draining and beading is done on the conveyor, including refrigerator liners, hydrators and range frames. The conveyor continues from the dipping area into the ground coat spray booth, then turns and enters the single pass tunnel type drying oven.

All tooling is very similar to that used at Dayton, and much thought has been given to design so as to obtain proper enamel drainage on all parts as they move with the conveyor. A spray type wash-off booth constructed on the ground coat conveyor line makes it possible to keep all tooling clean without the need for removing it from the conveyor. This method for washing hanging tools has been found to be very helpful, and particularly so where there is very little storage space available. A similar wash-off booth is installed on the white conveyor line. The floor of the dipping area is easily kept clean by hosing with water into the drain trench of the pickle machine. The closeness of the dipping

area to the mill room, the ease with which the dip tanks can be moved around, and the flexibility of the pump setup in the mill room makes it possible to pump the enamel from a dip tank back into a storage vat, or to rescreen and filter as desired by pumping it through the Roto-spray and magnetic separator equipment.

Pressure feed tanks are equipped with roller castor bases, so that they can be pushed from the mill room to the spray booths.

### **All spray booths are enclosed type**

All spray booths are of the entirely enclosed type. Ground coat and cover coat booths are the same size (19' long, 14' wide, 8' high), and four sprayers can work in each booth. The reinforcing booth adjacent to the exit of the ground coat drying oven is 13' long, 15' wide and 10' high. It is constructed in two sections so that the ware on the conveyor line can be worked on from either side. The air supply for all booths is taken from outside the building through screened and louvered intakes. Axial flow fans cause the air to pass steam coils for the initial preheating. It is then washed to remove large particles of dirt and to increase the humidity, especially during winter months. A second set of steam coils reheats the air to the temperature desired in the spray booth, and the air then passes through a bank of renewable cell filters to finish the cleaning. It enters the booth through microfuser diffusers which may be adjusted to give the desired airflow through the booth. Passing through baffle plates on the opposite side of the spray booth, the air encounters a water curtain. At the base of the water curtain, above the level of the water in the tanks, are numerous large exhaust tubes equipped with water spray nozzles. The air has to pass through the water spray before it is exhausted outside the building. Each spray booth has its own completely automatic temperature regulating equip-

ment which compensates for temperature changes outside the building on incoming air, as well as maintaining a constant temperature in the spray booths.

To avoid congestion all pressure feed tanks containing enamel are located outside the spray booths, and the enamel is brought into the booths through monel tubing just above the operator's head. Air transformers are mounted on the backwall of the booths together with pressure regulators which permit regulation of fluid pressure on the pressure feed tanks. In this way the air and fluid hose for each gun drop directly from above the operator, and each sprayer can readily adjust air or fluid pressure as desired without going outside the booth. A separate filtered air supply feeds the safety hoods worn by each sprayer. The arrangement of feed tanks outside the booths is such that there need be no interruption in the supply of enamel when one pressure feed tank becomes empty. Water connections are available at each booth so that all fluid lines can be quickly washed out at the end of each shift.

Ground and cover coat spray booths have 18,000 cubic feet of air passing through each minute. The reinforcing booth has 12,000 cubic feet per minute. The brushing booth requires another 18,000 cubic feet per minute so that a total of 66,000 cubic feet of air is exhausted from the building each minute. This prohibited the possibility of using the open type spray booth and maintaining desired temperatures in the building during the cold winter months. Nevertheless, the heating of this volume of air from 20 degrees below zero to approximately 80 degrees above zero and immediately exhausting it outside the building is a costly problem which confronts the enameling industry in Canada during the winter months.

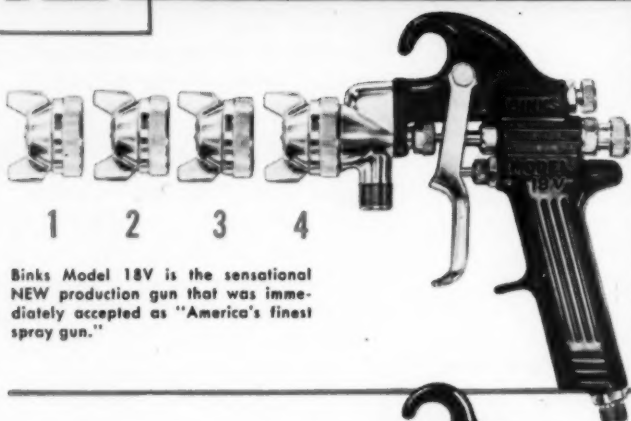
### **Electric drying ovens**

Ground coat and cover coat drying ovens are 6' wide, 8' high, and 60' and 70' long respectively. They are constructed of metal clad interlocking panels filled with 4" of

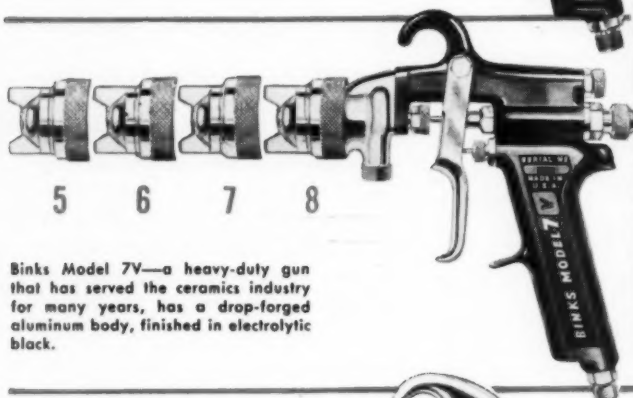
# 12

# different guns to choose from

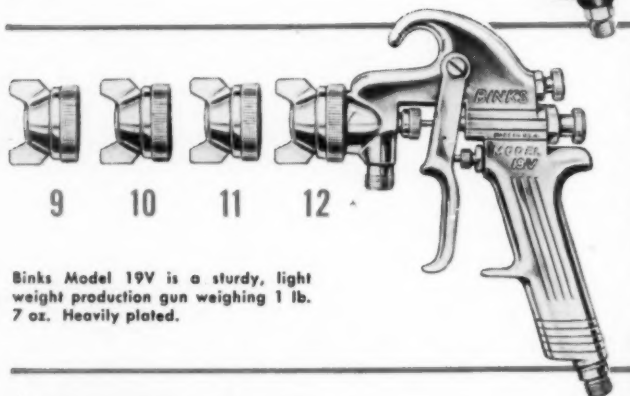
EACH MADE SPECIFICALLY FOR CERAMICS FINISHING



Binks Model 18V is the sensational NEW production gun that was immediately accepted as "America's finest spray gun."



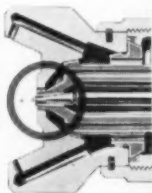
Binks Model 7V—a heavy-duty gun that has served the ceramics industry for many years, has a drop-forged aluminum body, finished in electrolytic black.



Binks Model 19V is a sturdy, light weight production gun weighing 1 lb. 7 oz. Heavily plated.

## TUNGSTEN-CARBIDE INSERTS

Binks ceramics spray guns are designated in the catalog and elsewhere by the letter "V" as a suffix to the model number, as 18V, etc. This is an indication that such guns are fitted with tungsten-carbide inserts on the needle valve and material nozzle, as shown in the cut-away drawing, to protect these parts from the abrasive action of vitreous material.



Each of the three Binks ceramics spray guns on this page is designed to be used with any of four optional nozzle set-ups that you can specify or Binks engineers will recommend. Any of the four can be used interchangeably on the same gun.

**Why nozzle set-ups?** First, there is the type of porcelain enamel to consider. Next, the thickness of the film to be laid, and third, the production speed. Any one of the set-ups will spray porcelain enamel . . . one of the four will do a better job for your particular shop.

## How nozzle set-ups vary



Nozzle set-ups vary in two ways:

- 1 the size of the orifice of the material nozzle, and
- 2 the sizes and arrangements of orifices, in the air nozzle.

The drawings above, which show nozzle set-ups for Binks Model 18V gun, look rather alike until examined closely. The decimal variations in the material and air orifices cannot be illustrated. Differences in the primary and secondary air ports are noticeably different in arrangement. They control atomization of the spray in relation to the size of the material orifice. There is nothing arbitrary about these arrangements . . . there are sound physical and mathematical reasons for making them that way, and something more than fifty years' experience in making precision finishing equipment prove they're right.

If you are not sure of the right nozzle set-up for your particular finish or product, let a Binks engineer study your problem and make his suggestions without obligation.

"Binks engineers are trained to the idea of helping solve your finishing problems; feel free to call upon them."

*J. P. Roche* President

# Binks MANUFACTURING COMPANY

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**BINKS**



mineral wool. Air is circulated by fan through electric ribbon element heaters mounted on structural steel supports in an insulated enclosure on the top of each oven. It passes into the oven through dampered pipes which extend down the side-walls on each side of the ovens. Each oven is equipped with air seals at each end and exhaust fans. The ground coat oven is designed to heat 10,000 pounds per hour and maintain 450°F. recirculating 90 percent of the air, and is rated at 360 K.W. The cover coat oven with the same load and maintaining 350°F. is rated at 540 K.W.

To conserve space, all control equipment has been mounted on elevated platforms adjacent to the drying ovens. Each oven is equipped with automatic temperature control. Fans supply 4500 cubic feet of air per minute on ground coat oven and 11,700 cubic feet per minute on cover coat oven. The floor in each oven is made from insulated interlocking metal clad panels laid on a concrete floor. The amount of air which is recirculated in the oven can be regulated as desired by valves in the exhaust outlets.

#### **Electric firing furnace, controls and tooling**

Low cost hydro power, as well as the numerous advantages of electrical heating, influenced the decision to install a continuous U type firing furnace. The total length of the furnace is 71 feet. The hot zone is 18'-6" long, 9'-5½" wide, with a centre partition wall. Nichrome ribbon heating elements are supported on porcelain insulators on all side walls, end wall, on both sides of the centre partition wall, and on the bottom of the furnace.

The furnace was designed to give 6,000 pounds per hour at 600 K.W. input, and considerable attention was given the problem of obtaining good insulation from heat loss. The roof is of suspended tile construction with insulated top. Side walls of the hot zone have 15 inches of vermiculite insulation after 9" of insulating firebrick. The preheating zone is also heavily insulated. The outer

finish AUGUST • 1948

shell is made from 3/16" steel plates supported by 6" channel buck-stays. There are two air seals in the preheat zone and a circulating air system to give a heat exchange from fired ware leaving the hot zone to unfired ware on the opposite ingoing conveyor line. There are two heavily insulated cleanout doors on the end of the furnace and one on each side of the entrance to the hot zone. Insulating alloy gratings cover the ribbon heating elements on the bottom of the furnace.

Alloy drop rods suspended from monorail track are spaced at 16 inch centres, and the conveyor chain has electric caterpillar drive and take-up. Seal plates are made of light gauge steel plate. A specially designed heavier alloy casting seal plate was tried out, but, due to excessive wear of flanges and track on top of the furnace, these were subsequently replaced with the lighter steel plates. In cases of electric power stoppage, the furnace can be unloaded and the conveyor line kept going with a 3.8 H.P. gasoline engine auxiliary drive.

Indicating and recording pyrometer controls are located on a panel at the discharge end of the furnace. There are five banks of elements in the hot zone, each having a thermocouple and gold safety fuse. Control panels and switches are located beside the hot zone. Fine mesh Inconel screen laid on top of the alloy gratings of the furnace bottom prevent small hanging tools dropping through the gratings and contacting the electric heating elements.

All alloy tooling used on the furnace line has been patterned after furnace tooling used at Dayton. Rugged construction in tool design for service, and to allow interchangeability of parts, has in many instances been given greater consideration than the desire for low toolware ratio. Since both ground coat and white coat are fired in the furnace at the same time, the basic tooling necessarily has been standardized.

#### **Enclosed brushing booth provides dust control**

The enclosed brushing booth is 19' long by 14' wide. The heated,

washed, tempered, and filtered air enters this booth through micro-fuser diffusers in the ceiling and flows directly down through gratings in the floor into a water tank. The air is then exhausted through tubes to the outside of the building similarly to the arrangement in the spray booths. All dust therefore is carried into the water sump underneath the floor of the booth.

All range and refrigerator parts with the single exception of hydrators are brushed on the conveyor line. Hydrators are removed from the conveyor and the entire top lip brushed by passing it over a large power brush mounted in a portable table which is wheeled into the booth when needed. The brushing is finished by hand with the hydrator sitting on revolving sponge rubber pedestals mounted on a table covered with sponge rubber. When finished, the hydrator is immediately hung on the furnace conveyor line which passes through the brushing booth. Electric motors with white flexible dental cables and handle chucks attached are suspended above the operators' heads from carriages on a monorail track. Specially designed brushes, together with fixtures and shields, permit most of the brushing to be done by these power tools. Conveniently located cup spray guns permit the making of minor repairs when necessary in the brushing booth.

#### **General consideration in processing**

Unlike most other Canadian plants, Frigidaire's practice calls for only one white coat application on all range and refrigerator parts, and whiteness standards are considerably higher on some parts than those generally acceptable in the United States. Titanium acid-resisting enamels are used on range tops and hydrators, and antimony acid-resisting enamel on the bottom of refrigerator liners. Standard zirconium white is used on all other parts. Plant layout requires that the furnace line handle ground coat and white parts at the same time—hence a high speed ground coat

to Page 68 →



# Honeyed WORDS

"Words" are free to all of us! The words of the able business man are flavored with sincerity . . . those of the side show barker coated with honey. It is in the performance of promises that the syrup is removed.

PEMCO has never sweetened its promises with honeyed words. It has always performed on the basis that you prefer profits to praise. While we at Pemco, believe that there are but few things incapable of accomplishment . . . we also believe that you would prefer a sincere and honest "No!" to an idle "promise,"—flattering for the moment, but of little value in performance. The approval of this policy, by the entire Porcelain Enameling Industry, finds expression in the steady and sound growth of Pemco, the Largest Manufacturer of the World's Finest Porcelain Enamel Frit.

What this means to you can only be expressed in terms of profitable satisfaction and mutual appreciation and respect.



P E M C O

C O R P





# ROBINATION

Baltimore 24, Maryland

Always Begin With a Good Finish

→ from Page 65

enamel is used. Ground coat and white coat are fired at temperatures ranging between 1520-1550°F. with black and white parts alternating on the furnace burning racks.

Conveyor lines have been so arranged that at each loading and unloading station the operator need not move more than one step in making the transfer of a part. The speed of the ground coat and white coat conveyor lines are synchronized with the speed of the furnace chain as loading conditions vary. Theoretically this should be a very simple matter, but in actual operation with scheduling calling for a large number of different parts in small volume, it necessitates constant and careful attention. Careful control of operating practices is also very essential since not infrequently all parts of an individual type may be sprayed and on the furnace line before the first fired finished part can be examined. Excellent modern equipment is therefore essential for smooth operations and economy in a small plant designed for continuous mass type production.

All equipment other than control panels for the drying ovens is on ground floor level. Conveyor lines therefore are all at approximately the same height above the floor and the load stresses on the conveyor lines quite uniform. Cable type conveyors built, with the exception of drives, in the company's machine shop, are used on both ground coat and cover coat lines. Practically all electrical equipment used throughout the porcelain plant was made in Canada. Hydro power in the area is 25 cycle—hence all motors and electrical equipment operate on this frequency.

#### **Inspection starts with the raw metal parts**

Raw parts are inspected for surface imperfections and forming abnormalities before they are sent through the pickle machine. They are inspected again as they come out of the pickle machine. Lugs on food compartment liners are checked to a template and sides bowed slightly,

by hammering with a rubber mallet, to correct for slight change in shape during subsequent firing in ground coat. The next inspection occurs after firing ground coat as the part is being cooled on the cover coat conveyor line. Minor defects in ground coat are corrected by stoning the part on the conveyor line. All parts having serious defects are removed from the line and taken to the repair bench before they are reoperated. Defective white parts come directly from the final inspection tables to the repair bench before reoperation.

After firing one white coat, each part is removed from the furnace line and placed directly on long inspection tables. These tables are equipped with special overhead 60 cycle diffused daylight fluorescent lights to give the inspector a constant non-flickering light for their work. Additional reflector type lights mounted on movable stands supplement the overhead lighting when liners are going through inspection. Color matching is done by comparison with standard color plates mounted in fan like arrangement in a holder. The color number is stamped on the front of each range panel for selection at range line assembly. The same color number is marked on the back of each panel to assist field men in case the panel has to be replaced at some time.

#### **Chief inspector has authority**

The chief porcelain inspector makes frequent spot checks during daily operations of adherence qualities, checks enamel thickness, and makes test on acid resisting parts. He has full authority to scrap any part or to send it back for reoperation without interference from the operating department. Inspection is directly responsible to the Factory Manager who decides all controversial inspection problems.

High inspection standards are maintained. The abnormally high cost of servicing and replacement in many of the remote northerly districts in Canada prohibits acceptance of anything which might possibly give trouble. This applies not only to porcelain but to all manufactur-

ing operations and to the finished products being shipped out of the plant. There are cases on record where a serviceman has had to spend a week in travelling to make some minor adjustment to a refrigerator or to replace a damaged or defective part.

#### **Two laboratories for enamel and chemical control**

Enamel and chemical control is recognized as an important part of enameling operations and two well equipped laboratories are an integral part of the porcelain plant. The enamel control laboratory could not be placed adjacent to the mill room due to lack of sufficient space in the area. However, its present location beside the chemical control laboratory introduces no serious problems, and there are distinct advantages in having both laboratories together under the constant supervision of a ceramic engineer.

General practice is to test all smelts of frits as they are received from the manufacturer and acceptance or rejection of each smelt is based on the laboratory tests. Likewise, each milling of enamel is tested in the laboratory before it is released to the operating floor. It has been found that this control testing has been very worthwhile. Titanium enamel used on certain parts, particularly range tops, is tinted to get a color match with the zirconium enamel used on range side and front panels, and test panels are fired in both laboratory and production furnace before the enamel is used in production. The laboratory makes checks, on random samples taken from the production line, for adherence, thickness and uniformity of application, reflectance and color, in addition to the daily checks of these variables by the porcelain inspector. Constant checks are made daily on the gravity and pick-up of the enamel in the dip tanks and pressure feed tanks while they are in use. Spraying technique is under constant observation by the laboratory, and the cause of abnormal operating conditions and reoperations are studied continuously.

The solutions of the pickle tanks

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**METAL CLEANER DEPARTMENT**

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are tested daily, more frequently if necessary, and concentrations are maintained within narrow control limits. Actual tests are run to check the cleaning ability of the alkali cleaners as well as the daily titrations and calculation of activity factor. The hydrogen ion concentration of the nickel solution is checked and controlled carefully within a narrow range, and the deposition of nickel measured analytically at frequent intervals. Neutralizer tanks are watched very carefully and the tanks dumped each week. Sulphuric acid and nickel tanks have been dumped after six months of continuous operation although the iron concentration was still very low in the acid, and nickel concentration and deposition satisfactory. It appears that dumping the cleaner tanks every three months is amply sufficient.

The enamel control laboratory is equipped with a Rotap machine and automatic timer to standardize all sieve tests. Production sieves are checked frequently against a standard sieve. A monel metal sink and drain cupboard with hot and cold water taps and gooseneck spray nozzles, and other facilities to make unloading of laboratory mills simple, is located close to the laboratory spray booth. A gravity cup spray gun is used in the laboratory because of the ease with which this type of gun can be cleaned and the enamels changed. The spray booth has an exhaust fan, roller turntable spraying stand, inside lighting, water connection, and concrete floor with drain. The booth can be thoroughly cleaned quickly by merely hosing with water. The electric laboratory furnace has an 18" x 12" x 8 $\frac{3}{4}$ " muffle and is equipped with complete automatic controls and indicating pyrometer. A laboratory scale with platter and self reading scale in grams is used for gravity and pick-up tests, and a small sensitive triple beam scale for fineness tests. An "L" double laboratory mill fitted with steel encased one gallon porcelain jars is used for all laboratory millings. Slump tests are made. Standardization of procedure in taking cylindrical tests for pick-up from pressure

food tanks, and large dip tanks has been accomplished by a device on the same principle which lifts the test cylinder vertically out of the enamel at a constant rate. Before this apparatus was put into use, there were significant differences in results depending upon what individual took the test.

The chemical and physical laboratory is adequately equipped to make all necessary chemical analyses on pickle solutions, and all test solutions are made up and standardized in the laboratory. The nickel solution hydrogen ion concentration is determined with a glass electrode pH meter. Included in the porcelain laboratory apparatus are a fine chainomatic chemical balance, electro analyser, thermostatically controlled drying oven, photovolt reflectometer, metallographic microscope, binocular microscope, adherence impact tester, water still, and large electric hot plate. All walls, ceiling and chemical tables are finished in white, and considerable attention was given to lighting with 60 cycle fluorescent

fixtures. Chemical tables are equipped with hot and cold water, high and low pressure air, and gas. Numerous 25 and 60 cycle electrical outlets are handily located on all walls.

#### **Production obtained quickly with inexperienced crew**

The outstanding feature of this modern porcelain enameling plant has been the speed in which it was possible, with this continuous equipment, to get into production. The plant was started up with an entire crew who had no previous porcelain experience. Within a few weeks the plant was supplying the porcelain needs of refrigerator and range lines, and since the beginning of operations there has never been a shutdown of assembly lines due to failure of the porcelain unit to supply the necessary porcelain parts. Five hundred large porcelain food compartment liners are produced in one operating shift, and a liner starting through the pickle machine can be ready for use on the assembly line in less than two and a half hours.

### **Visual system of control**

*(Continued from Page 40)*

can be adapted quickly to any problem. It eliminates, according to the users, or greatly reduces the amount of time necessary for the accumulation of usable facts from a routine paper record.

In fact, it is a well known maxim that "in any kind of business operation, the greatest obstacles to efficiency are bottlenecks that appear from nowhere, and always develop at the wrong time." However, it is also true that bottlenecks do not just casually happen; they are the slow, constant growth of weak production or operating control which reflects the need for improvement. Students of postwar business controls generally agree that, in view of these facts, the remedy at hand is to have a stronger link of production or operation functions with the central control that gives an up-to-the minute picture of your business—graphic presentation of past, present and future operations, singly, combined,

and in proper sequence one to the other.

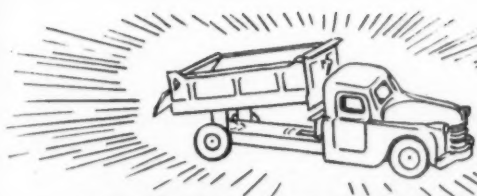
As users of such systems have pointed out:

When production (or as the case may be, operation) is under accurate central control, there's far less waste of time and money—because men, resources and/or necessities are used to their fullest capacity. Saving valuable man-hours and conserving vital executive time are among the important results of efficient production.

While before the war these needs and their objectives were appreciated and even sought in industry, the postwar world is becoming constantly more visual-minded, with the result that methods of operation in all kinds of enterprises today are converging to the point of the graphic presentation as in the instance described in this article.

\*Suggested reading, "Visual Controls In Business,"  
Wassell, Publisher, Westport, Conn.





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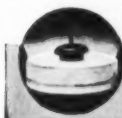
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## ADVERTISERS' INDEX

	PAGE
ABBE INC., PAUL O. ....	—
AMERICAN PORCELAIN ENAMEL CO. ....	—
ARMCO STEEL CORPORATION ....	1
BINKS MANUFACTURING COMPANY ....	64
BOLAND COMPANY, ALBERT J. ....	—
BROWN INSTRUMENT CO., THE ....	—
BURDETT MANUFACTURING CO. ....	71
CARNEGIE-ILLINOIS STEEL CORPORATION ....	5
CENTURY VITREOUS ENAMEL COMPANY ....	4
CERAMIC COLOR & CHEMICAL MFG. CO. ....	2nd COVER
CERTIFIED GAS EQUIPMENT, INC. ....	—
CHICAGO MILL & LUMBER COMPANY ....	6
CLASSIFIED ADVERTISING ....	72
CLEVELAND CO-OPERATIVE STOVE CO. ....	—
COWLES DETERGENT COMPANY, THE ....	69
DEKALB ENAMELING COMPANY, INC. ....	—
DESPATCH OVEN COMPANY ....	32
DETROIT BRASS & MALLEABLE WORKS ....	41
DE VILBISS COMPANY, THE ....	38 & 39
DINGS MAGNETIC SEPARATOR CO. ....	—
DRAKENFELD & CO., INC., B. F. ....	48
FAHRALLOY COMPANY, THE ....	—
FERRO ENAMEL CORPORATION ....	7
FERRO ENAMEL CORPORATION ....	47
FRANTZ CO., INC., S. G. ....	—
HARSHAW CHEMICAL COMPANY, THE ....	2
HOMMEL CO., THE O. ....	57
HUYCK CONSTRUCTION COMPANY ....	—
INDUSTRIAL FILTER & PUMP MFG. CO. ....	61
INGRAM-RICHARDSON MFG. CO OF INDIANA ....	13
INLAND STEEL COMPANY ....	18
INTERNATIONAL NICKEL COMPANY, INC., THE ....	—
KRAFT CHEMICAL COMPANY ....	—
LAWNDALE ENAMELING COMPANY ....	—
MAHON COMPANY, THE R. C. ....	9
McDANIEL REFRACTORY PORCELAIN CO. ....	11
MERCHANDISE MART, THE ....	—
METAL & THERMIT CORPORATION ....	—
METALLOY CORPORATION ....	71
METALWASH MACHINERY CORP. ....	43
MID-WEST PORCELAIN ENAMEL CO., INC. ....	54
NEW MONARCH MACHINE & STAMPING CO. ....	8
NORTHWEST CHEMICAL COMPANY ....	—
OREFRACTION, INC. ....	60
PATTERSON FOUNDRY & MACHINE CO., THE ....	16
PEMCO CORPORATION ....	66 & 67
PENNSYLVANIA SALT MANUFACTURING COMPANY ....	—
PETERS-DALTON, INCORPORATED ....	—
PORCELAIN ENAMEL INSTITUTE, INC. ....	12
PUNDERSON COMPANY, THE L. E. ....	55
ROBERTSHAW-FULTON CONTROLS CO. ....	52
ROHM & HAAS COMPANY ....	4th COVER
ROSS ENGINEERING CORP., J. O. ....	—
ROTSOPRAY MANUFACTURING COMPANY ....	15
SPARKLER MANUFACTURING CO. ....	53
TITANIUM ALLOY MANUFACTURING COMPANY ....	14
TITANIUM PIGMENT CORPORATION ....	—
TUTTLE & KIFT, INC. ....	34
UNITED STATES STEEL ....	5
VERSION ALLSTEEL PRESS COMPANY ....	—
VITREOUS STEEL PRODUCTS COMPANY ....	10
VITRO MFG. CO., THE ....	—
WEBB COMPANY, JERVIS B. ....	—
WIREBOUND BOX MFG. ASSN. ....	—
WYANDOTTE CHEMICALS CORPORATION ....	—
YOUNGSTOWN SHEET & TUBE COMPANY ....	3rd COVER

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→ from Page 35

comes off the assembly line, it is carried by an overhead hoist to the shipping section and lowered upon the crate base especially designed to carry its weight. The top of the crate is then placed in position. The wrap-around wirebound crate sides, which come flat in one section from the factory for easy handling and stacking, are folded into shape and placed so that bottom cleats fit snugly beneath the edges of the base and the top cleats fit about the edges of the top. The closure is quickly made by engaging opposing wire loops and bending them tight with a special tool. The entire crating operation has consumed approximately five minutes.

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